(No Model.) 3 Sheets—Sheet 1.

J. T. HAYDEN.

VALVE MECHANISM FOR AIR BRAKES.

No. 495,488. Patented Apr. 18, 1893.

Fig. 1.

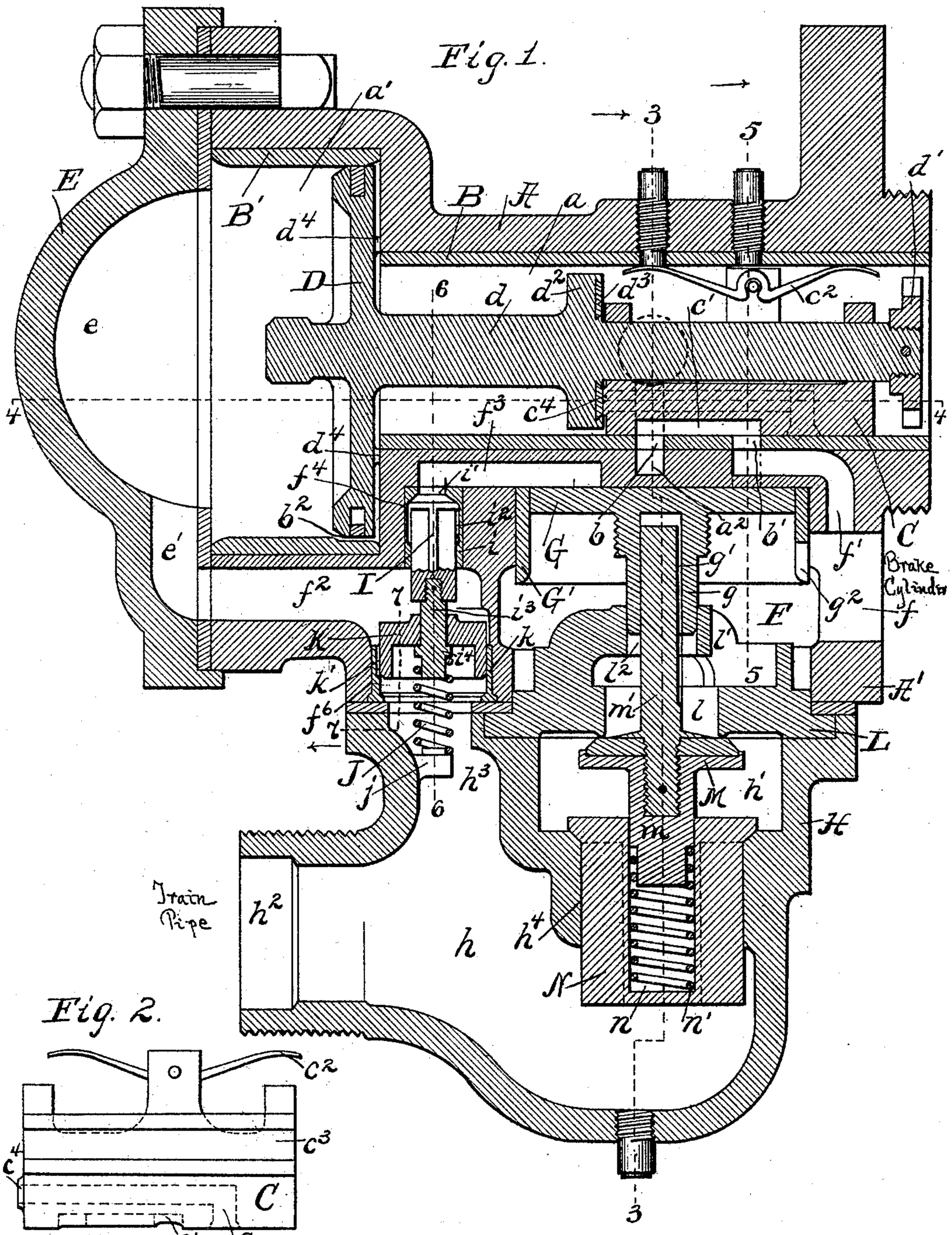

Fig. 2.

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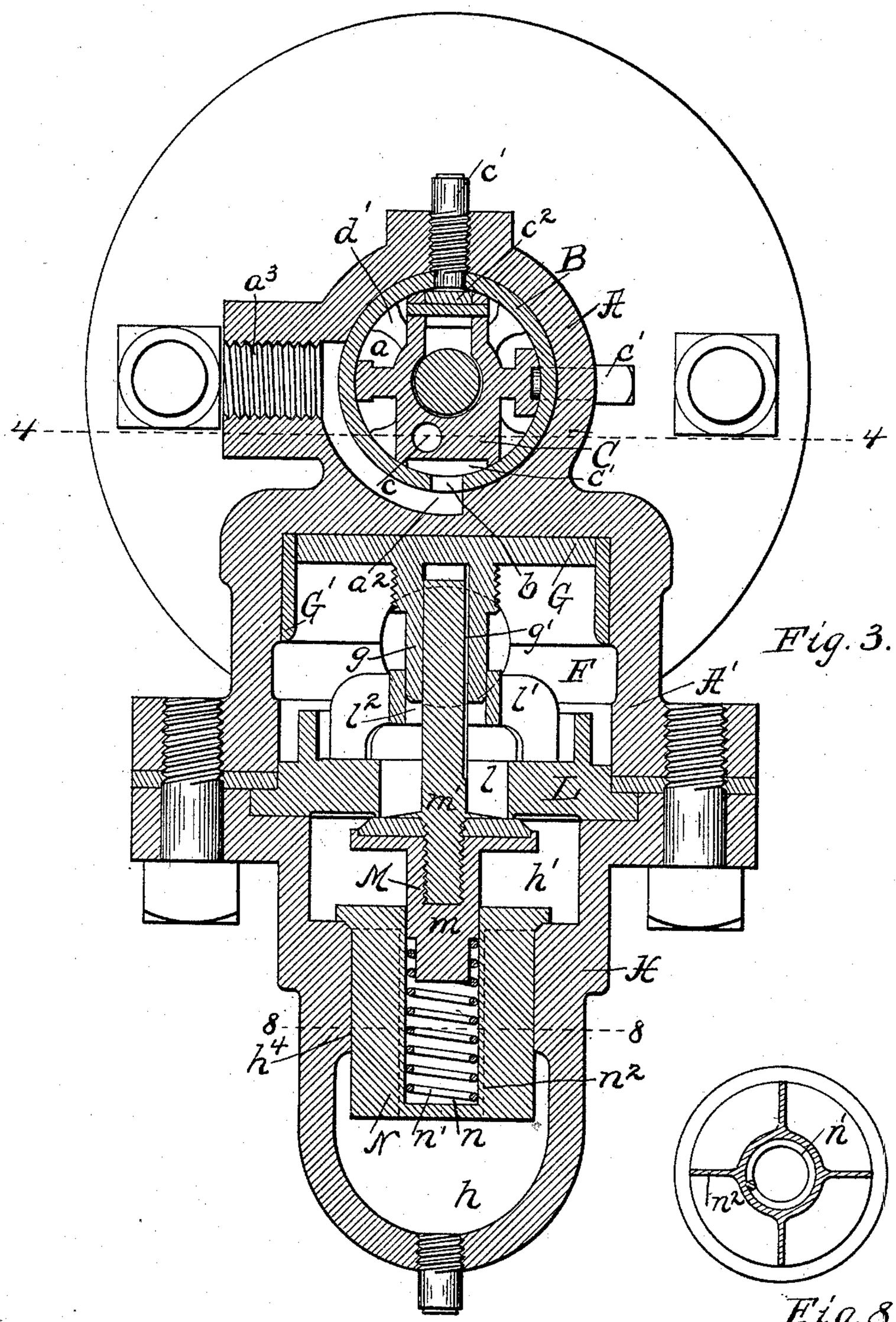

Fig. 3.

Fig. 8.

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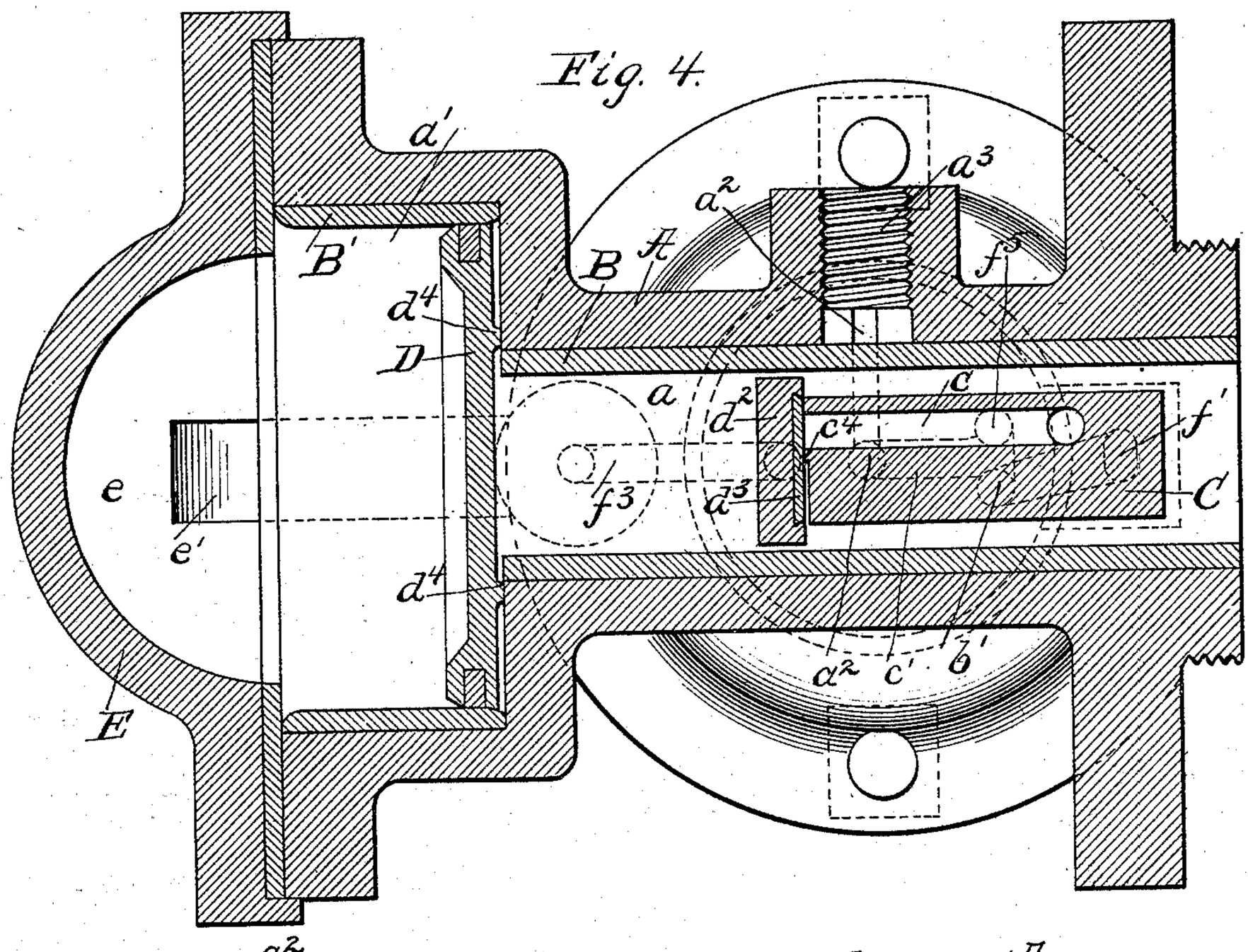
Fig. 4.



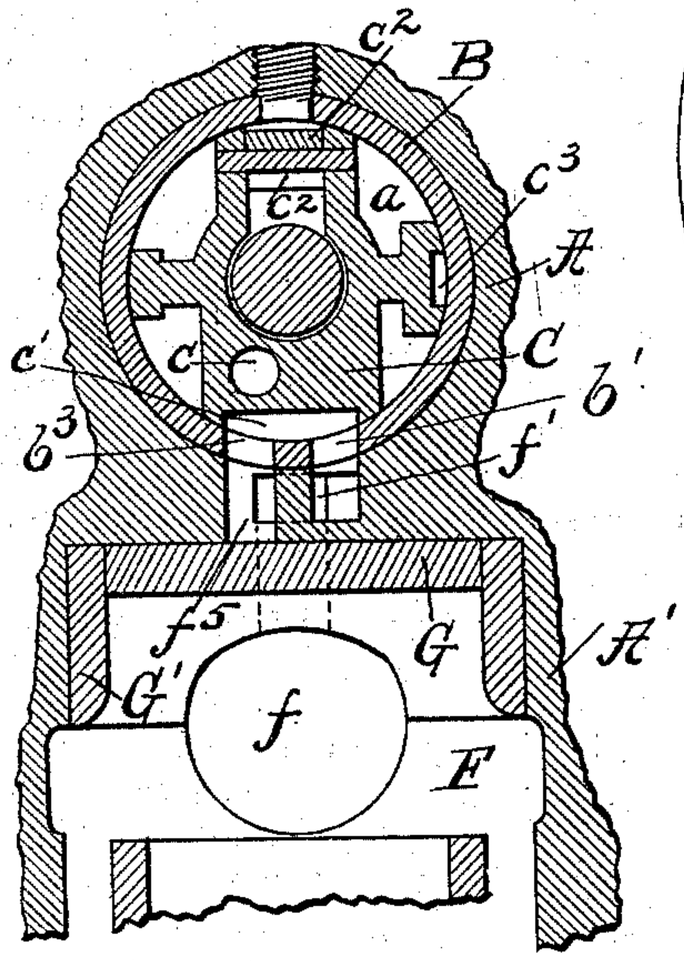


Fig. 5.

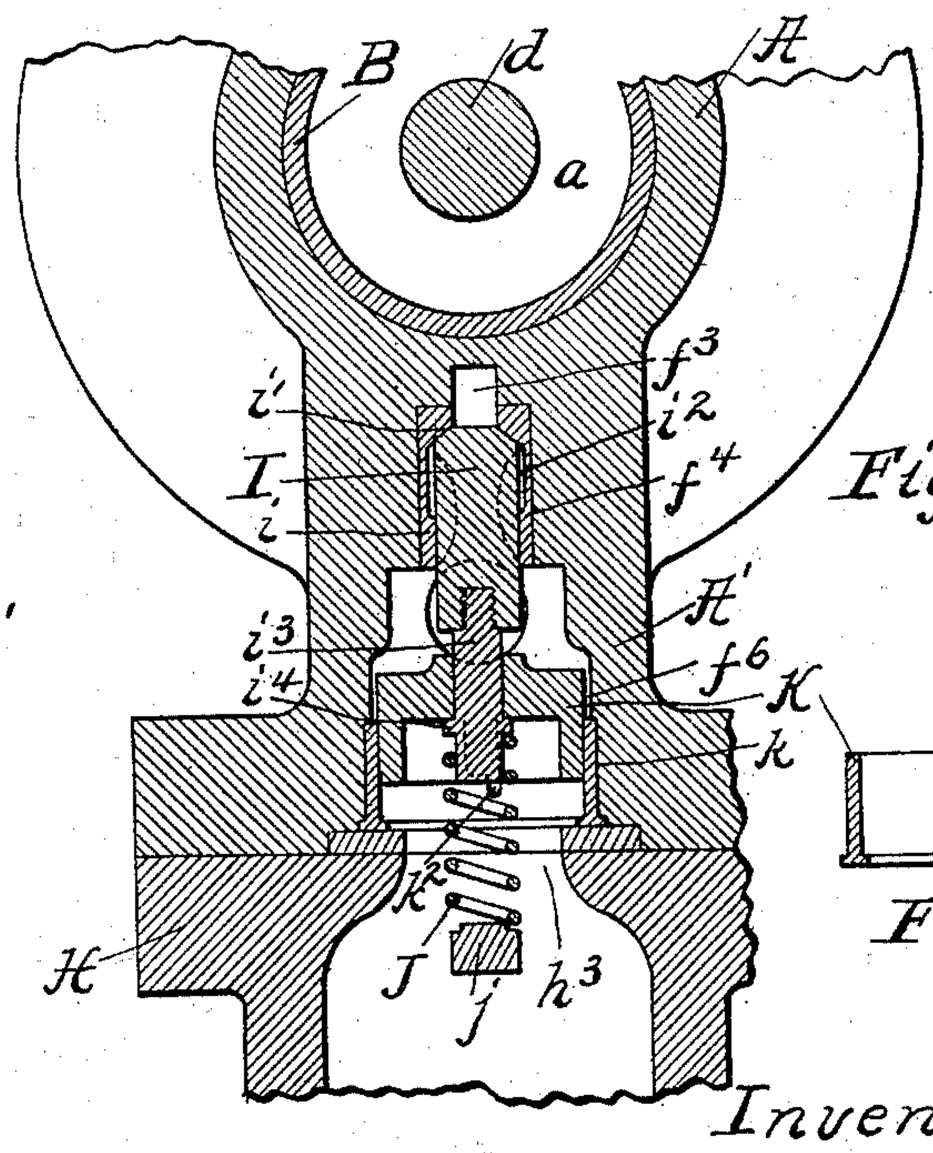


Fig. 6.

Fig. 7.

Witnesses
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UNITED STATES PATENT OFFICE.

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VALVE MECHANISM FOR AIR-BRAKES.

SPECIFICATION forming part of Letters Patent No. 495,488, dated April 18, 1893.

Application filed April 20, 1892. Serial No. 429,906. (No model.)

To all whom it may concern:

Be it known that I, JAMES T. HAYDEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Valve Mechanism for Air-Brakes, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a vertical section of a triple-valve mechanism embodying my invention; Fig. 2, a side elevation of the main slide valve detached; Fig. 3, a cross-section, taken on the line 3—3, of Fig. 1; Fig. 4, a plan section, taken on the line 4—4, of Fig. 1; and Fig. 3; Fig. 5, a detail cross-section, taken on the line 5—5, of Fig. 1; Fig. 6, a detail cross-section, taken on the line 6—6, of Fig. 1; Fig. 7, a detail section of a supplementary valve piston, taken on the line 7—7, of Fig. 1; and Fig. 8, a bottom plan of the puppet valve between the emergency valve chamber and the train pipe.

My invention relates to a valve mechanism designed for use in automatic air brake apparatus and in connection with the device now generally known as the "triple-valve." The triple-valve is organized in connection with an auxiliary air reservoir, a brake cylinder, and a train pipe or main air pipe under each car, and coupled up to make complete connection from the main air reservoir or air pump to the rear car of the train in the usual way. Usually there is also employed with this mechanism an "emergency-valve" which is operated by the sudden momentary reduction of pressure in the train pipe to open up communication directly between the latter and the brake cylinder, for the purpose of obtaining the full pressure in the train pipe to quickly set the brakes whenever occasion demands.

My present invention relates mainly to the emergency-valve and the means of operating it. This valve is intended to be actuated by the pressure of air in a chamber, consisting mainly of the main piston cavity, to open connection between the train pipe and the brake cylinder whenever the pressure in the former is suddenly greatly reduced. In this respect the valve mechanism here shown corresponds with that described and shown in my prior application, Serial No. 428,551, filed April 9, 1892, and may be considered as an improvement upon the invention therein described and shown.

In the drawings I have shown so much of a triple-valve and its connections as is necessary to an understanding of my invention and I will now describe in detail the construction and operation of the mechanism here shown, wherein I have embodied my invention in a practical way, and will then point out more definitely in claims the particular improvements which I believe to be new and wish to secure by Letters Patent.

In the drawings, A represents a triple-valve case which is constructed with a long cylindrical chamber, *a*, which is the main valve chamber, and at one end a short cylindrical chamber, *a'*, much larger in diameter, which is the main piston chamber. A bushing, B, is fitted and secured within the chamber *a* and within it is seated the main valve, C. The main piston, D, is fitted, as usual, in the chamber *a'*, the latter being provided with a bushing, B', within which the piston is mounted and suitably packed. The stem or rod, *d*, of the piston extends back through the chamber *a* and the valve C is mounted on this stem between two collars, one, *d'*, at the outer end and the other, d^2, about midway of its length, the valve being a little shorter than the space between these collars, so as to provide for a slight independent movement of the rod in the valve. The valve C is provided with a passage, *c*, which runs from the inner end of the valve nearly the entire length and then turns down, at right angles, and opens in the face of the valve. In the under side of the valve there is also cut out a large recess, *c'*, below the longitudinal portion of the said passage. The valve is held down upon its seat by a spring, c^2, and is held from turning in its seat, by means of a longitudinal groove, c^3, in one of its side wings, into which fits a screw-pin, C', inserted from the outside of the case. The passage *c* is closed at the inner end of the valve by the inner collar d^2 as usual, and in order to secure the certain closing of this passage, the said collar is provided with an annular gasket, d^3, of rubber or other suitable

material, adapted to close against the passage, as seen in Fig. 1, and for further security the valve may be provided with a slightly projecting flange, c^4, around the passage opening, against which the gasket will rest.

In the bushing B, below the slide valve, there are two ports b—b', the former of which connects with an exhaust passage, a^2, in the case A running around back of the bushing B and connecting with the exhaust port, a^3, in the side of the case. The other port b' connects with a passage, f', which communicates with the brake-cylinder, as will presently be described.

The valve chamber a connects, as usual, at its outer end with the auxiliary air reservoir and at its inner end with the piston chamber a'; the latter is closed by a cap, E, which is preferably concave upon its inner face to provide a concave space or small chamber, e, which serves as an extension of the piston cavity and from the lower portion of which there leads out a port or passage, e', extending downward and then inward, as seen in Fig. 1.

In the bushing B′ there is provided a by-pass, b^2, extending around the main piston when the latter is in the position shown in Fig. 1 and making communication with the valve chamber a in any suitable way; in the drawings it is accomplished by holding the piston slightly away from its seat, by means of small inside lugs, d^4, as seen in Figs. 1 and 4.

The main valve casing A has an enlarged extension, A′, below the valve chamber, in which is formed a chamber, F, which communicates by a passage, f, opening out at one side thereof, directly with the brake cylinder, and a port or passage, f', in the partition between the valve chamber a and chamber F, connects this opening f with the port b' in the bushing B. In this extension of the case, underneath the piston chamber a', there is a horizontal passage, f^2, which connects with the passage e' and extends inward thence toward the chamber F, but does not enter it directly.

In the upper part of the chamber F there is seated a piston, G, being mounted in a suitable bushing, G′, set in the upper part of the chamber.

In the partition immediately below the inner end of the main valve chamber a, there is provided a horizontal passage or port, f^3, at its inner end opening directly into the chamber F over the piston G and at its outer end communicating with a passage, f^4, leading directly downward thence to the passage f^2. At the opposite side of the piston G there is also a small port, f^5, leading up directly over the piston and registering with a port, b^3, in the bushing B, which is also underneath the main valve C, as seen in Fig. 5.

A supplementary case, H, is arranged underneath the main case extension A′ and is secured thereto. This supplementary case has within it two chambers h, h'; the former is connected by a suitable inlet, h^2, with the train pipe and by a suitable passage, h^3, leading upward therefrom, with an opening, f^6, communicating directly with the horizontal passage f^2, thus providing communication between the train pipe and the main piston cavity. The small chamber h' is formed in the upper part of the casing by a suitable partition wall and is open at the top and at the bottom is provided with a large central aperture, h^4, communicating directly with the chamber h below.

In the vertical passage f^4 there is mounted a valve, I, which controls the connection between the passage f^2 and the port f^3. A bushing, i, is set in the passage for this valve, being formed with a port, i', in its upper end, below which is a suitable seat for the valve which is winged, the port being considerably smaller than the central opening through the bushing. The central opening in the bushing is slightly enlarged for a little distance below the valve seat, so as to leave a narrow clear space, i^2, entirely around the winged part of the valve part way down the bushing, as seen in Figs. 1 and 6 to permit air to escape past the valve-head when the latter is unseated. The stem, i^3, of this valve extends down into the opening f^6 where it is received by the upper end of a spring coil, J, the lower end of which is seated upon a lug, j, projecting from the casing H into the passage h^3 and held in place on the stem by means of a collar, i^4, thereon. A valve or piston, K, is mounted on the valve stem i^3 between the lower end of the valve and the collar on the stem and having some free sliding motion thereon, this longitudinal space on the stem being greater than the thickness of the piston bearing. This piston is seated in a bushing, k, set in the opening f^6. The piston is cup-shaped with the cup downward, as seen in Figs. 1 and 6, thus providing for considerable travel of the piston within its seat without disconnecting the two.

In one side of the bushing k there is provided a by-pass, k', around the piston K. The by-pass does not extend down the whole length of the bushing, however, so that it will be closed by a partial downward movement of the piston. At its extreme lower end the small channel, which forms this by-pass, is very much constricted, so as to leave only a a very small opening, k^2, at this point, while the main opening k' is of full width, as seen in Fig. 7.

The chamber h' is covered by a cap, L, which is a separate piece of circular form, and is secured between the case extension A′ and the supplementary case H when the two are fastened together, as seen in Fig. 3. In this cap, however, there is a central opening, l, which forms the port for the emergency valve, M, which is arranged in the chamber h' and is seated around this central aperture on the lower side of the cap.

It will be seen that this provides a means of communication between the chamber h' and the chamber F immediately above the cap and so, of course, through the latter with the brake cylinder, which communication is controlled by the valve M. This valve M is double-stemmed; on the under side it is provided with a stem, m, which may be called the stem proper, that extends down and enters a puppet valve, N, which is seated in the aperture h^4 between the two chambers h, h' and arranged to close the same against pressure from the lower chamber. This valve is provided with a central recess or socket, n, formed to receive the stem m of the emergency valve and a spring, n', is arranged in the socket below the stem, thus providing for holding the valve upon its seat against a pressure from below less than the pressure of the spring. The valve itself is of the winged type, being provided with radial wings, n^2, below the valve disk or head, as seen in Fig. 3, so that immediately the valve is raised from its seat, communication is opened between the two chambers. A supplementary stem, m', extends upward from the front of the valve and is received within the rod or stem, g, of the piston G, this rod being hollow, or provided with a socket, g', adapted to receive the stem m', as seen in Figs. 1 and 3. A bridge, l', is formed on the upper side of the cap L, by means of arms rising upward therefrom and then turning inward to a common center,—a well-known construction. This bridge is provided with a central opening, l^2, which makes a bearing for the lower end of the piston rod g, as seen in Figs. 1 and 3. The spring n' also seats the emergency valve under all ordinary circumstances, but it is evident that a sufficient pressure upon the piston G will force the latter down, carrying with it the upper stem of the emergency valve and thus open the latter. The relative length of the rod of the piston G and the upper stem of the emergency valve is such, however, that when both are closed there will be a slight space between the upper end of the valve stem and the lower or inner end of the socket in the piston rod, as seen in Fig. 3, so that there may be a slight initial movement of the piston G without acting upon the emergency valve. The bushing G′ of the piston G is cut away at its lower edge on the side next to the brake cylinder, as seen at g^2, in Fig. 1, so as not to obstruct the said passage from the chamber F to the brake chamber. It is obvious that when the piston G is closed or seated, it will close the port f^5, as seen in Fig. 5, and, of course, will open said port whenever the piston moves downward. The supplementary stem m' of the valve M is preferably triangular for most of its length, though this particular form is not a necessity.

The operation is as follows: When the apparatus is coupled up through the train and air is let into the train pipe, it passes up by the piston K and thence into the main piston cavity, forcing the latter back into the position shown in Fig. 1 and past the said piston through the main valve chamber to the auxiliary reservoir, until equilibrium of pressure is obtained on both sides of the main piston in the usual way. The several parts of the mechanism will then be in the position seen in Fig. 1. When the pressure in the train pipe is slightly reduced for the ordinary application of the brakes, the difference in the pressure on the other side of the piston K will not be sufficient to move the said piston, and so the pressure in the main piston cavity will be reduced by the leakage through the by-pass around the said piston into the train pipe. The greater pressure from the reservoir on the other side of the main piston will now move the latter as usual, first independently of the main valve and so open the main passage therein and then moving the valve itself until the said passage registers with the port b', thus opening communication between the valve chamber and the brake cylinder and so connecting the latter with the auxiliary reservoir and applying the brakes by pressure therefrom; upon releasing the brakes equilibrium is again restored. In an emergency requiring the quick setting of the brakes with full force, the pressure in the train pipe is suddenly and momentarily reduced, as usual. This results in the outward or downward movement of the piston K, thereby at once closing the by-pass and unseating the valve I, thus opening communication between the main piston cavity and the top of the emergency valve piston G. This piston is at once forced downward against the upper stem of the emergency valve and unseats the latter, when the pressure from the train pipe will force the puppet valve N from its seat and so open communication directly between the train pipe and the brake cylinder, so that the brakes are applied with the full force of pressure in the train pipe, in addition to the pressure in the auxiliary reservoir, which is available as in the first instance. The movement of the piston K under these circumstances is due to the fact that the passage of air through the by-pass from the main piston cavity to the train pipe is not sufficiently rapid to maintain the equilibrium and so, of course, the piston must move downward and in so doing it at once closes the by-pass against any further escape of air in that direction. The restoration of normal pressure in the train pipe, of course, returns the several devices to their normal position of equilibrium, as already explained. The exhaust in both instances takes place as soon as the main valve returns to the position, seen in Fig. 1, the exhaust being into the recess underneath the valve and thence out through the port b to the exhaust passage. In the return movement of the devices, air over the piston G is forced out by the upward movement of the latter through the ports f^5 and b^3 also opening into the recess on the under side of the valve and

so to the exhaust, as explained above. It will be noticed that a very slight outward movement of the main piston closes the by-pass around it and, as already explained, a very little movement of the piston K closes its by-pass, and so the main piston cavity becomes practically a closed chamber, except an outlet is made by the unseating of the valve I. If the release is sudden the passage of air through the by-pass around the piston K will not be sufficient with a by-pass of ordinary size like the lower portion k^2 thereof, which, however, is sufficient for ordinary purposes. The enlargement of this by-pass above is, therefore, provided, so that upon the slight raising of the piston K by increase of pressure the flow through the by-pass will be much greater and so strain upon the piston obviated and equilibrium of pressure more readily and quickly obtained. The device for closing the main passage in the main valve by means of a gasket on the piston rod collar is very effectual in securing a tight joint and preventing any leakage under ordinary circumstances. It will be noticed in this construction and organization of devices that communication between the main piston chamber and the actuating piston of the emergency valve is very direct and the passage short; and it will also be noticed that the same is true in relation to the communication between the train pipe and the brake cylinder which is controlled by the emergency valve; the result is very quick and efficient action of the emergency valve and the setting of the brakes due to the opening of the latter.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a triple-valve air brake mechanism, the main piston cavity connecting directly with the train pipe, a supplementary piston-chamber or cavity, connecting directly with the brake cylinder, the train pipe, and the passage leading from said train-pipe to the main piston cavity, an emergency valve controlling the passage between said supplementary chamber and the train pipe, a piston arranged in said chamber and adapted to actuate the emergency valve, and a valve mechanism controlling the connection between the main piston cavity and both the supplementary chamber and train pipe, adapted to be actuated by pressure in the main piston cavity upon the sudden decrease of pressure in the train pipe, substantially as described.

2. In a triple-valve air brake mechanism, a main valve chamber a, in combination with a main piston chamber a', a supplementary chamber F arranged underneath the former and connecting with the brake cylinder, a port f^3 opening into the upper or front part of said supplementary chamber and connecting with the main piston cavity, a passage f^6 connecting the train pipe with the main piston cavity, a valve I controlling the passage from the main piston chamber to the chamber F, a piston K mounted on the stem of said valve and seated within the passage f^6, and a returning spring for the said valve, substantially as described.

3. In a triple-valve air brake mechanism, the main valve chamber a, in combination with the main piston chamber a', provided with a by-pass around the piston at the inner end thereof, a passage connecting the main piston chamber directly with the train pipe, and a piston K mounted in said passage and provided with a by-pass arranged to open around the piston when in normal position and to be closed at once by the downward movement of the piston from such normal position, substantially as described.

4. In a triple-valve air brake mechanism, the main piston cavity connected directly with the train pipe, in combination with a piston K mounted in and controlling said passage, and a by-pass around said piston, having a small opening k^2 at its inner end and an enlarged opening k' outward therefrom, substantially as described.

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