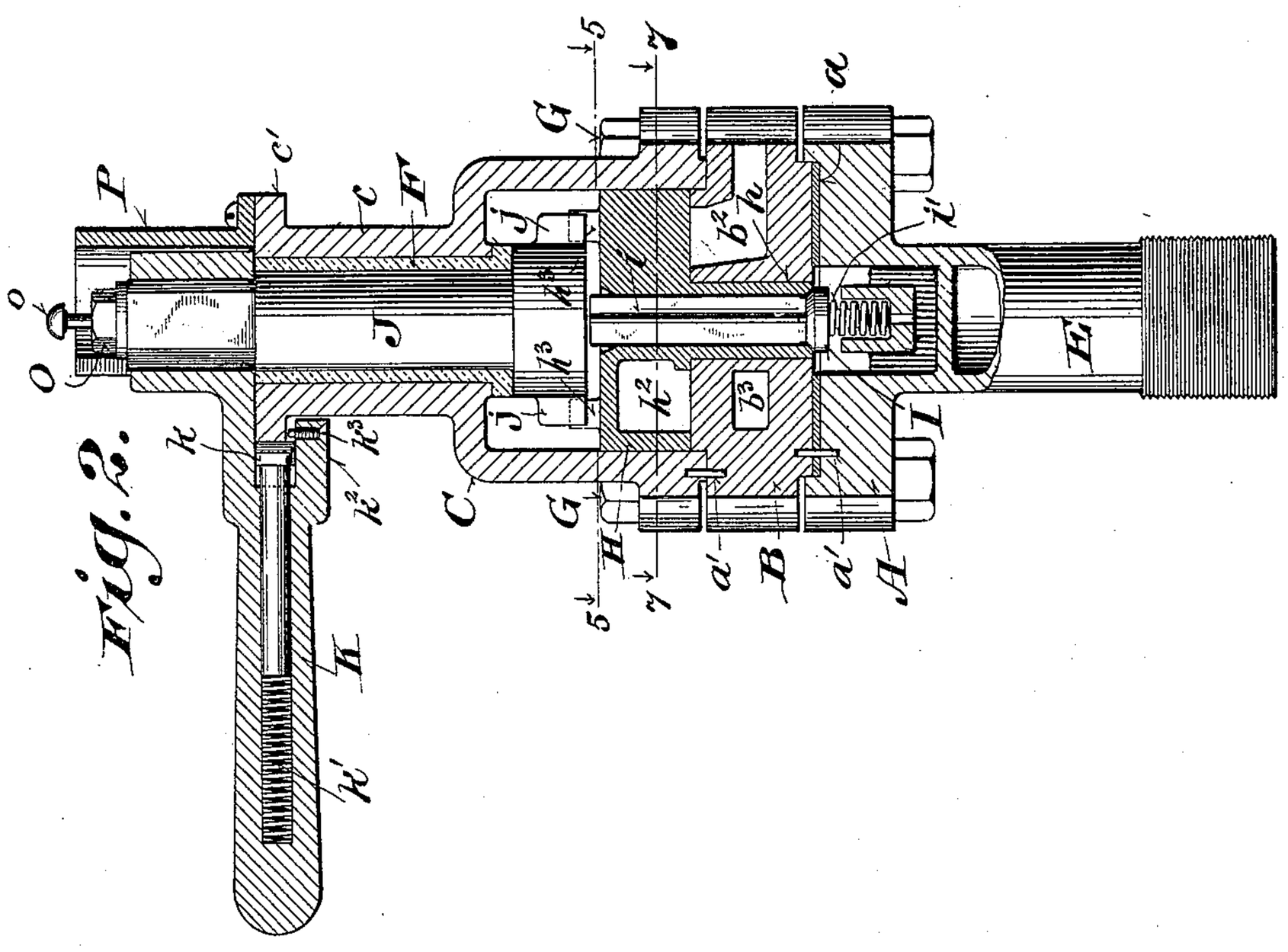
No. 644,127. Patented Feb. 27, 1900.

N. A. CHRISTENSEN.

ENGINEER'S VALVE.

(Application filed Mar. 14, 1898.)

(No Model.) 2 Sheets—Sheet 1.



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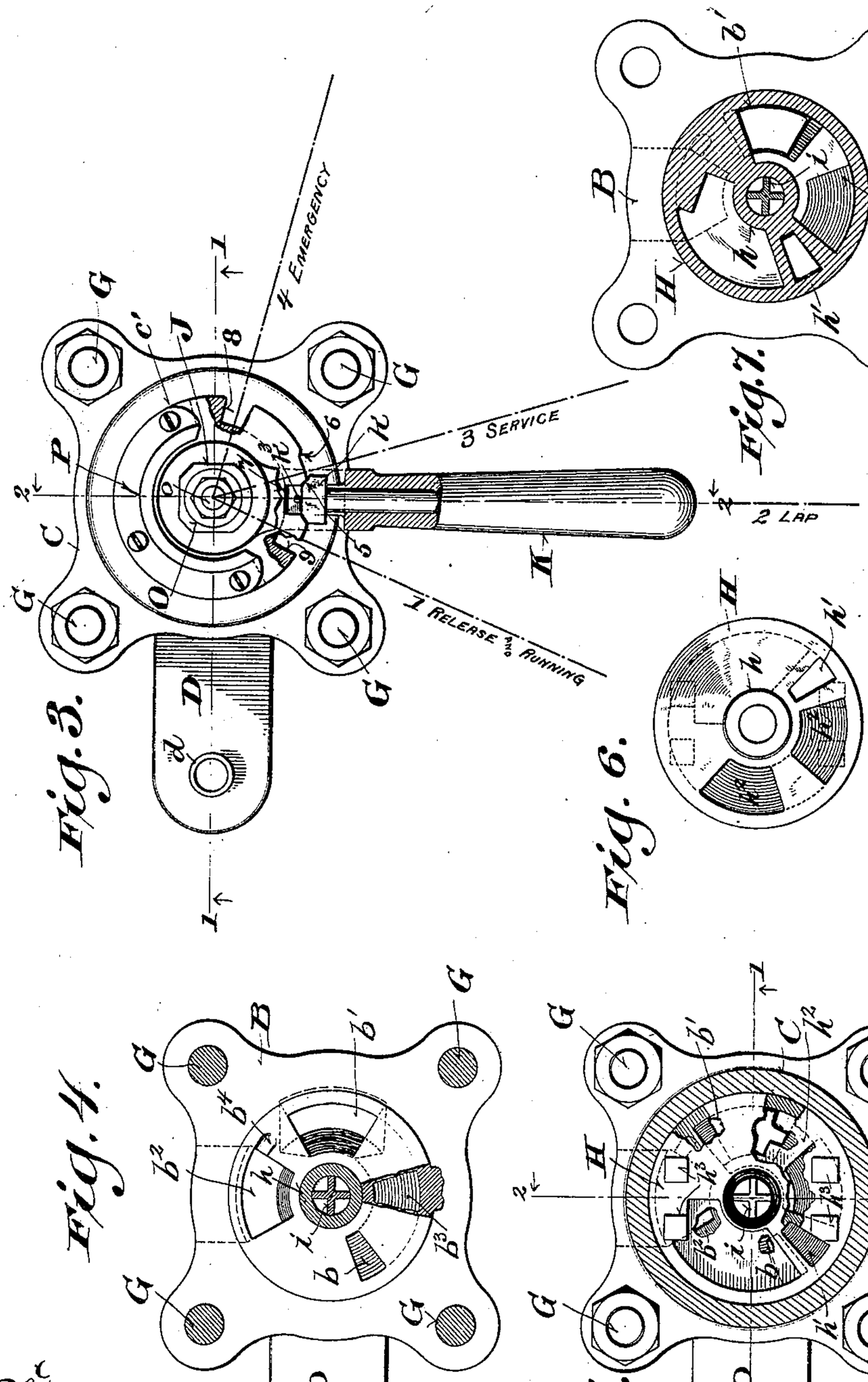

Fig. 3.

Fig. 7.

Fig. 6.

Fig. 4.

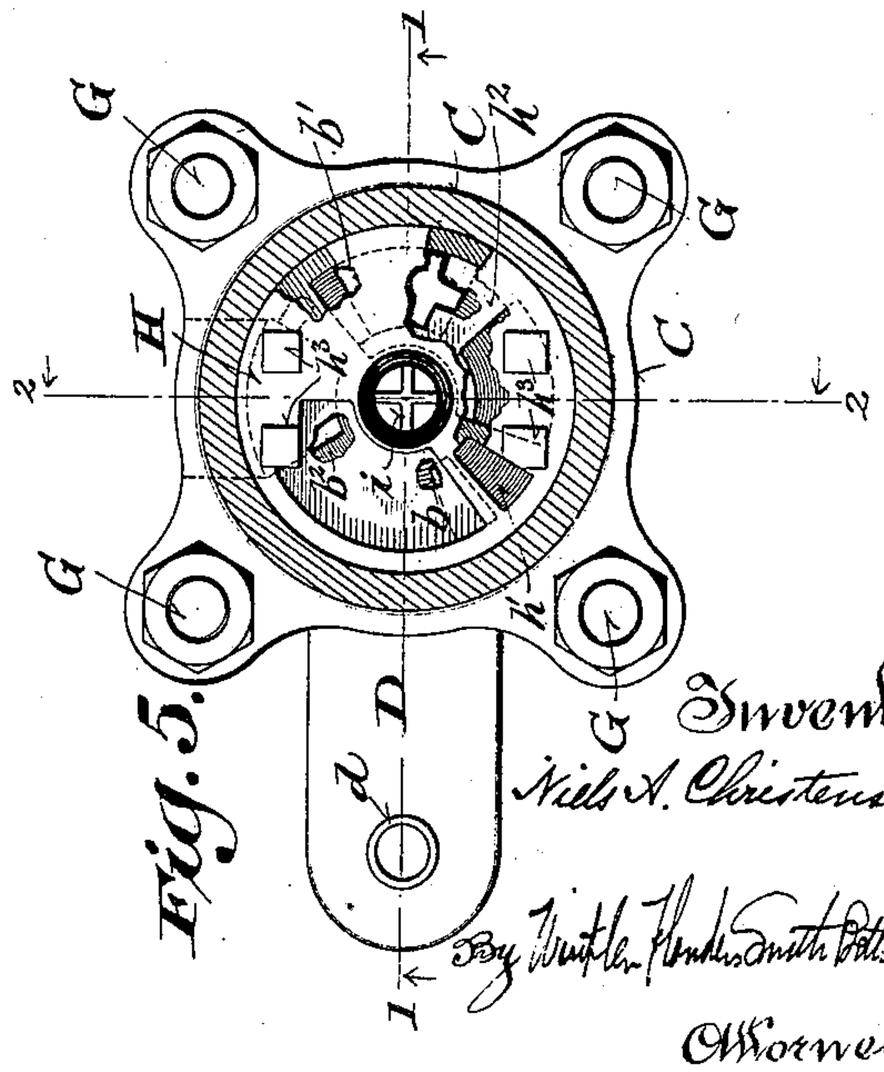

Fig. 5.

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UNITED STATES PATENT OFFICE.

NIELS A. CHRISTENSEN, OF MILWAUKEE, WISCONSIN.

ENGINEER'S VALVE.

SPECIFICATION forming part of Letters Patent No. 644,127, dated February 27, 1900.

Application filed March 14, 1898. Serial No. 673,753. (No model.)

To all whom it may concern:

Be it known that I, NIELS A. CHRISTENSEN, a subject of the King of Denmark, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Engineers' Valves, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to that class of valves by means of which locomotive-engineers manually control the operation of brakes actuated by compressed air or fluid-pressure. Its main object is to simplify and improve the construction and operation of this class of valves.

It consists of certain novel features in the construction and arrangement of component parts of the valve, as hereinafter particularly described, and pointed out in the claims.

In the accompanying drawings like letters and numerals designate the same parts in the several figures.

Figure 1 is a medial vertical section on the line 1 1, Figs. 3 and 5, of an engineer's valve embodying my improvements. Fig. 2 is a similar section on the line 2 2, Figs. 3 and 5. Fig. 3 is a plan view of the valve. Fig. 4 is a plan view of the valve-seat and lower section or part of the valve, the upper section of the valve-case and the main valve being removed. Fig. 5 is a similar view of the valve, the valve-case being shown in horizontal section on the line 5 5, Figs. 1 and 2. Fig. 6 is an inverted or face view of the main valve; and Fig. 7 is a horizontal section on the line 7 7, Figs. 1 and 2, the upper part of the valve-case being removed.

The valve-case is preferably made in three sections or parts—A, B, and C. The lower or base section A is formed with necks D and E for the attachment of the main reservoir and train-pipes. The middle section B is formed on the upper side with a raised valve-seat, which has a supply-port b, a train-pipe port b', and an exhaust-port b^2, as shown in Fig. 4. The supply-port b is connected by a passage b^3 (shown in Fig. 2) with the port b'. The port b' registers with the train-pipe connection E. The port b^2 communicates through a lateral opening or passage with the atmosphere, as shown in Fig. 2, and has on one side, next to the port b', a graduating groove or notch b^4 for service application of the brakes. The upper section or cap C, forming the main-valve chamber, has a neck c, in which is fitted a bushing F. The three sections or parts of the valve-case are secured together by bolts G, passing through ears or flanges formed on each section, and their proper positions relative to each other are determined in assembling them by dowel-pins a'. (Shown in Fig. 2.) Between the lower and middle sections A and B a gasket a, of rubber, leather, or other suitable material is interposed to form a tight joint. The gages for indicating the main-reservoir and train-pipe pressure are attached to the necks or pipe connections D and E by tubes d and e. By thus constructing the valve-case in three parts and making the pipe connections with the lower part both the middle and upper parts B and C, together with all the internal mechanism, can be readily detached from the lower or base section of the valve, and when the upper cap-section C is removed the joint between the main valve and its seat is exposed, so that any inaccuracy in fitting can be readily detected, and by reason of its projecting above the surrounding face of section B the valve-seat can be easily ground or refitted.

H is a disk-shaped main valve having a tubular stem h, open at both ends and fitted to turn in a central cylindrical hole through section B, extending from the passage in the main-reservoir connection D into the main-valve chamber. The valve is accurately fitted on its under side around the stem h to the valve-seat and has a through port or passage h', corresponding with the port b in the valve-seat. It also has a cavity h^2 opening through its under or working face and adapted, when the valve is turned into position for an emergency application of the brakes, to connect the train-pipe and exhaust-ports b' and b^2 in the valve-seat and afford an unrestricted passage for train-pipe air to the atmosphere. This cavity h^2 may open through the valve-face, as shown in Fig. 6, in two ports which are separated by an intervening bridge or bearing piece and which correspond in area and relative position with the ports b' and b^2; but the bridge-piece may be omitted and the cavity left completely open on the under side without material effect upon the operation of

the valve, the bridge-piece merely affording a more extended bearing and wearing face. The tubular stem *h* of the main valve forms a passage for the main-reservoir air from the main-reservoir connection D into the main-valve chamber above the valve H.

I is a regulating-valve having a seat in and adapted to close upwardly against the lower end of the tubular stem *h* of the main valve. It is formed or provided with a winged stem *i*, which projects upwardly through and is guided in the tubular stem *h*. A spring *i'*, pressing upwardly against the valve I, tends to close the same.

In the bushing F of the upper section C of the valve-case is fitted to turn a tubular stem J, which is squared at its upper end and provided with a detachable handle K and is formed at its lower end with wings *jj*, adapted to engage with lugs h^3 on the upper side of the main valve and to turn said valve, at the same time allowing it to be held by the pressure upon its upper face snugly against its seat.

In the lower end of the stem J, the bore of which is enlarged, is fitted a piston L, which is capable of a limited vertical movement therein. It has a rod *l* projecting upwardly therefrom into a tubular adjusting-screw M, which is threaded in the upper end of the stem J, as shown in Fig. 1. Between said piston and adjusting-screw is interposed a spring N, which tends to force the piston downwardly against the upper end of the stem of the regulating-valve I and to open said valve. The lower end of the stem J is provided with a keeper *j'*, which projects underneath the piston L and retains the same in place in said stem when the upper section of the valve-case is removed. The upper end of the stem J is closed by a cap or plug O, in which is fitted a push button or pin *o*, projecting at its lower end into the tubular screw M and adapted by engagement with the upper end of the piston-rod *l* to force said piston downward against the fluid-pressure in the main-valve chamber and to open the regulating-valve I. This push button or pin affords means for manually holding the regulating-valve I open and augmenting the train-pipe pressure when such pressure is sufficient to hold the piston L out of engagement with the stem of the regulating-valve.

The operating-handle K is provided with a detent *k*, which is held by a spring *k'* (shown in Fig. 2) in yielding engagement with the periphery of an outwardly-projecting flange *c'* on the upper end of the neck *c*. This flange is formed with shoulders or breaks 5 and 6, as shown in Fig. 3, to determine the lap and service positions of the main valve. The handle K is also formed or provided with an arm k^2, which extends underneath the flange *c'* and prevents the removal of said handle from the stem J, except when said arm is brought opposite a notch or recess 7 in the flange *c'* and the main valve is on lap, as shown in Fig. 5. The neck *c* is formed in the path of the arm k^2 with projections 8 and 9, which form positive stops for limiting the movement of the handle K in both directions and determining the release and running and the emergency positions of the main valve. A screw or pin k^3 retains the detent *k* in place in the handle K when the latter is removed from the stem J.

To prevent grasping and turning the stem J by hand when the handle K is removed, a shield P is placed over or partially around the exposed squared end of said stem, as shown in Figs. 1, 2, and 3.

The valve, as shown in the drawings, is made for attachment to the connections of the standard engineer's valve of the Westinghouse Air-Brake Company.

The device operates as follows: When there is no pressure in either train-pipe or main reservoir, the regulating-valve I will obviously be held open by the spring N; but when the main reservoir is charged the compressed air will pass through the tubular stem *h* of the main valve into the main-valve chamber, and if the main valve is in release and running position the air will pass through the feed or supply port *h'* in said valve, the corresponding port *b*, and the passage b^3 into the train-pipe port *b'* in the valve-seat, and thence into the train-pipe, thus charging the several auxiliary reservoirs under the individual cars with which the train-pipe is connected through the usual triple valves. This will continue until the train-pipe pressure has reached the predetermined point for which the spring N has been adjusted—say seventy pounds—whereupon the piston L will be forced up against the resistance of the spring N and will allow the regulating-valve I to be seated by the spring *i'*, thus closing communication between the main-valve chamber and the main reservoir, in which a higher pressure—say ninety pounds—is maintained. Any reduction of the train-pipe pressure while the main valve is in this position, due to leaks, will allow the spring N, acting through the piston L upon the stem *i*, to open the regulating-valve I, and the pressure in the train-pipe will thus be restored, whereupon the regulating-valve will be closed again in the manner above explained.

For a service application of the brakes the first movement of the valve-handle K is from release and running to lap position. In the latter position the main valve closes all the ports in the valve-seat. A further movement of the handle into service position uncovers the graduating groove or notch b^4 of the exhaust-port b^2, allowing air to escape gradually from the train-pipe through the port *b'*, cavity h^2, and thence through said graduating groove into the exhaust-port b^2, thus effecting a service application of the brakes.

For making an emergency application the handle is moved to the extreme right, as indicated by dotted line 4 in Fig. 3, thus estab-

lishing a direct and unobstructed passage from the train-pipe connection E through the port b' and the cavity h^2 of the main valve into the exhaust-port b^2 and causing a sudden reduction of pressure in the train-pipe and a full and instant application of the brakes.

The valve stands normally when the train to which it is applied is in motion in release and running position, and it will be observed that it assumes but four different positions in operation, including release and running and emergency positions.

From a comparison of my improved valve, as herein shown and described, with others of its class, especially those in general use, it will be found to contain fewer parts and to be of much simpler construction.

In place of the piston L any other form of movable part, such as a diaphragm, that will perform the same function may be employed. In short, various changes in the minor details of the device may be made without departing from the principle or intended scope of my invention.

I claim—

1. In an engineer's valve the combination of a valve-case having main-reservoir and train-pipe connections and an exhaust-port, a main valve controlling communication between the train-pipe and the main reservoir and between the train-pipe and the exhaust-port, a single supply-passage leading from the main-reservoir connection into the main-valve chamber, a regulating-valve in said passage controlling the entire supply of air from the main reservoir to the train-pipe, a movable part exposed to train-pipe pressure and adapted to cause the opening of said regulating-valve when such pressure falls below a predetermined limit and to admit air from the main reservoir into the train-pipe when the main valve is in releasing and running position, and a spring acting on said movable part in opposition to the train-pipe pressure and tending to open said regulating-valve, substantially as and for the purposes set forth.

2. In an engineer's valve the combination of a valve-case having main-reservoir and train-pipe connections and an exhaust-port, a main valve controlling the admission and release of air to and from the train-pipe, a supply-passage leading from the main-reservoir connection into the main-valve chamber, a regulating-valve in said passage controlling the entire supply of air from the main reservoir to the train-pipe, a movable part adapted to cause said regulating-valve to open when the train-pipe pressure falls below a certain limit and to admit air from the main reservoir into the train-pipe when the main valve is in releasing and running position, a spring acting upon said movable part in opposition to the train-pipe pressure and tending to open said regulating-valve, and means for adjusting the tension of said spring, substantially as and for the purposes set forth.

3. In an engineer's valve the combination with a suitable case having main-reservoir and train-pipe connections and an exhaust-passage and provided with a valve-seat having supply, train-pipe and exhaust ports, the exhaust-port having a graduating groove or notch on one side, of a disk-shaped valve having a through supply passage or port, a cavity in its working face and a tubular stem fitted to turn in an opening in the valve-seat and forming a passage between the main-reservoir connection and the valve-chamber, the supply-port of the valve-seat being connected by a passage with the train-pipe port, substantially as and for the purposes set forth.

4. In an engineer's valve the combination with a suitable valve-case having main-reservoir and train-pipe connections and an exhaust port or passage, of a disk-shaped main valve having a tubular stem fitted to turn in an opening through the valve-seat into the main-reservoir passage and forming a continuation of said passage into the main-valve chamber, a regulating-valve adapted to close the passage in said tubular stem and provided with a stem which is guided in said tubular stem, a tubular valve-operating stem fitted to turn in the valve-case, provided at its outer end with an operating-handle and engaging at its inner end with the main valve, and a movable part fitted to work in the inner end of said valve-operating stem and adapted to open the regulating-valve when the train-pipe pressure falls below a predetermined limit, substantially as and for the purposes set forth.

5. In an engineer's valve the combination with the main valve of a passage leading from the main-reservoir connection into the main-valve chamber, a regulating-valve controlling said passage, a movable part adapted to open said regulating-valve when the train-pipe pressure falls below a certain limit and means for manually opening said regulating-valve, substantially as and for the purposes set forth.

6. In an engineer's valve the combination with a suitable case having main-reservoir and train-pipe connections and an exhaust-opening, of a main valve controlling the supply and release of the fluid-pressure medium to and from the train-pipe, a regulating-valve adapted to close a passage leading from the main-reservoir connection into the main-valve chamber, means for automatically opening and closing said regulating-valve when the train-pipe pressure falls below and rises above a certain limit, and means for manually opening said regulating-valve, substantially as and for the purposes set forth.

7. In an engineer's valve the combination with a valve-case having main-reservoir and train-pipe connections and an exhaust-opening, of a main valve having a tubular stem which is fitted in an opening through the valve-seat into the main-reservoir passage and forms a continuation of said passage into the main-valve chamber, a regulating-valve

adapted to close the passage in the stem of the main valve, and having a stem guided therein, a spring tending to close the regulating-valve, a tubular valve-operating stem fitted to turn in the valve-case and engaging at its inner end with the main valve, a movable part fitted in the inner end of said valve-operating stem, exposed on one side to the pressure in the main-valve chamber and adapted when said pressure falls below a certain limit to open the regulating-valve, and a spring contained in said valve-operating stem and acting against said movable part in opposition to the fluid-pressure on its opposite face, substantially as and for the purposes set forth.

8. In an engineer's valve the combination of a valve-case having main-reservoir and train-pipe connections and an exhaust-opening, of a main valve controlling the admission and release of the fluid-pressure medium into and from the train-pipe, a regulating-valve controlling a passage from the main-reservoir connection into the main-valve chamber, a hollow stem fitted to turn in the valve-case, engaging at its inner end with the main valve and provided at its outer end with an operating-handle, a movable part in the inner end of said stem adapted to open the regulating-valve when the train-pipe pressure falls below a certain limit, a tubular adjusting-screw threaded in said stem, a spring interposed between said screw and movable part and acting thereon in opposition to the fluid-pressure in the main-valve chamber, and a push-pin projecting through the upper end of said stem for manually pressing said movable part into position to open the regulating-valve, substantially as and for the purposes set forth.

9. In an engineer's valve the combination of a valve-case provided with an outwardly-projecting flange and with stops, a valve for controlling the admission and release of fluid under pressure to and from the train-pipe, and a handle detachably connected with the valve-operating stem and having a spring-actuated detent adapted to indicate by its engagement with shoulders or notches in the flange on the valve-case the lap and service positions of the valve and having a projection extending below said flange and adapted by the engagement with the stops on the valve-case to limit the movement of the valve in both directions, in release and running position in one direction, and in emergency position in the other direction, the flange on the valve-case being notched or cut away to permit the removal of said handle only when the valve is on lap, release and service positions, substantially as and for the purposes set forth.

In witness whereof I hereto affix my signature in presence of two witnesses.

NIELS A. CHRISTENSEN.

Witnesses:
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