No. 701,842. Patented June 10, 1902.

N. A. CHRISTENSEN.

ENGINEER'S VALVE.

(Application filed Aug. 27, 1900.)

(No Model.) 2 Sheets—Sheet 1.

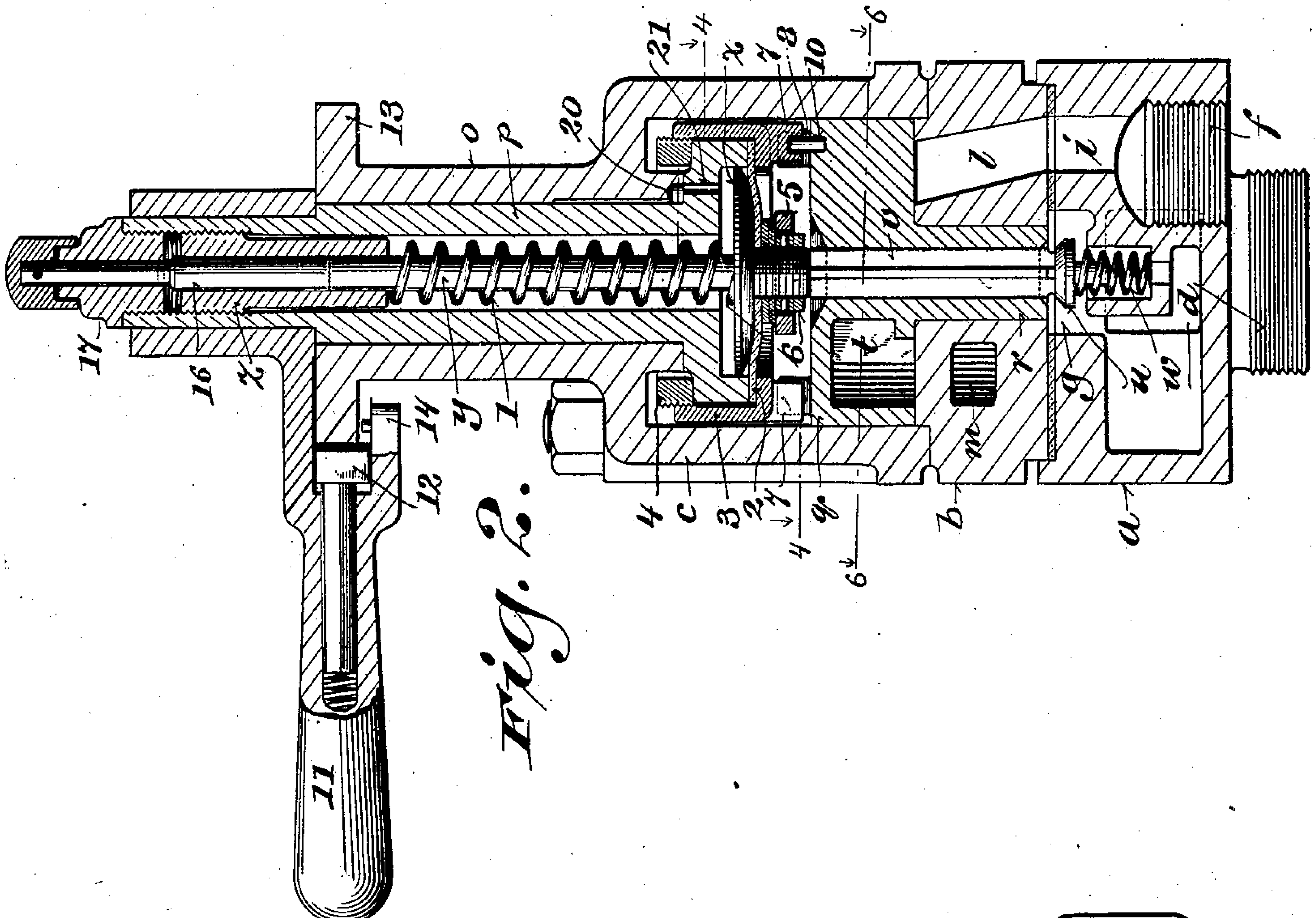

Fig. 2.

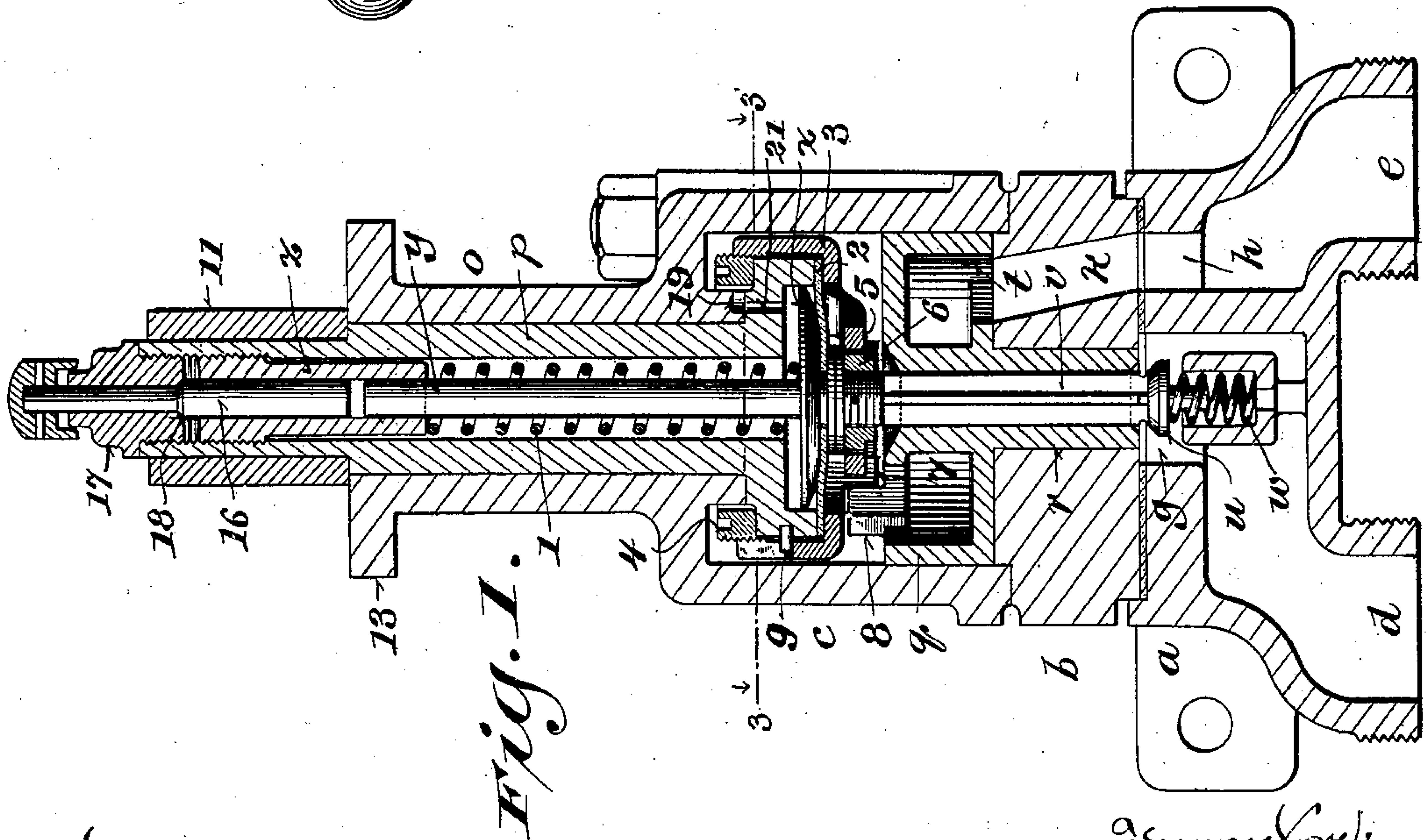

Fig. 1.

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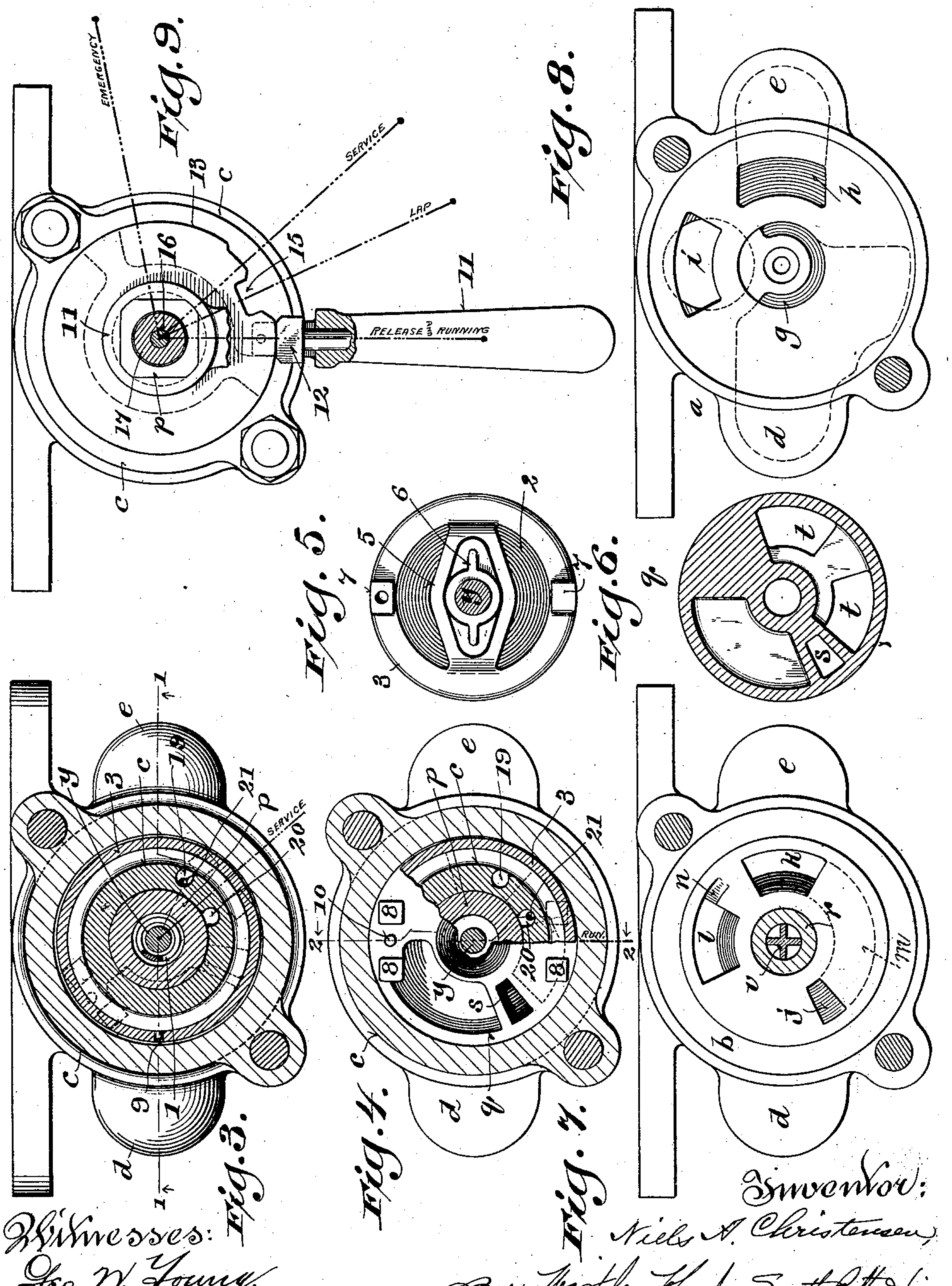

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UNITED STATES PATENT OFFICE.

NIELS A. CHRISTENSEN, OF MILWAUKEE, WISCONSIN.

ENGINEER'S VALVE.

SPECIFICATION forming part of Letters Patent No. 701,842, dated June 10, 1902.

Application filed August 27, 1900. Serial No. 28,149. (No model.)

To all whom it may concern:

Be it known that I, NIELS A. CHRISTENSEN, a citizen of the United States, 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 engineers' valves of the kind shown in United States Letters Patent No. 644,127, issued to me February 27, 1900, and having automatic regulating or feed valves which control the supply of compressed air from the main reservoir to the train-pipe when the main valve is in release or running position.

The main object of my present invention is to insure the restoration of the proper working pressure in the train-pipe and prompt release of the brakes after a service application of the brakes or a slight reduction in train-pipe pressure without manually opening the feed-valve or a by-pass between the train-pipe and main reservoir.

The invention consists in certain novel features in the construction and arrangement of component parts of an engineer's 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 vertical section of the valve on the broken line 1 1, Fig. 3. Fig. 2 is a similar section on the broken line 2 2, Fig. 4. Fig. 3 is a cross-section on the line 3 3, Fig. 1. Fig. 4 is a similar section on the line 4 4, Fig. 2. Fig. 5 is an inverted plan view of the casing of the expansion-chamber at the lower end of the main-valve-operating stem. Fig. 6 is a horizontal section on the line 6 6, Fig. 2, of the main valve. Fig. 7 is a plan view of the main valve seat. Fig. 8 is a plan view of the lower section of the valve-case; and Fig. 9 is a plan view of the valve, certain parts being broken away and shown in horizontal section.

The valve-case and its connections, the main valve, and the automatic regulating or feed valve may be like or similar to those shown in my former patent above mentioned in general construction and arrangement, but are susceptible of modification within quite wide limits without affecting the character of my present improvements and without departing from the principle and intended scope of my invention.

As shown in the drawings, the valve-case is preferably made in three parts *a*, *b*, and *c*, which are separable from each other in substantially horizontal planes and are secured together when assembled by bolts, as shown in several figures of the drawings. The lower or base section is formed with necks *d* and *e* for the attachment of the main reservoir and train-pipes, respectively, as shown in Fig. 1, and with a threaded socket *f* for the attachment of an exhaust or waste pipe. Ports or passages *g*, *h*, and *i* are formed through the upper face of this section in communication with the main-reservoir, train-pipe, and exhaust connections, as shown in Figs. 1, 2, and 8. The middle section *b*, which has a raised face on the upper side forming the seat for the main valve, is formed with supply, train-pipe, and exhaust ports *j*, *k*, and *l*, as shown in Fig. 7, and with a passage *m*, connecting the supply-port *j* with the train-pipe port *k*, as shown in Figs. 2 and 7. A graduating-groove *n* for service application of the brakes is formed in the valve-seat and opens into the exhaust-port *l* on the side thereof next to the train-pipe port *k*, as shown in Fig. 7. The upper section or the cap *c* is formed with a contracted tubular neck *o*, in which the tubular valve-operating stem *p* is fitted to turn, as shown in Figs. 1 and 2.

q is the main valve, formed on the underside with a tubular stem *r*, which is fitted to turn in a central square opening in the middle or seat section *b* of the valve-case. It is formed, as shown in Figs. 4 and 6, with a through-port *s*, corresponding in size and shape with the port *j* in the seat, and with a cavity *t* opening through its working face for connecting the train-pipe port *k* with the exhaust-port *l* and graduating-groove *n* in making emergency and service applications of the brakes. The tubular stem *r* forms a passage leading from the port *g* in the base-section *a* into the main-valve chamber or the space above the main valve.

u is the automatic regulating or feed valve,

provided with a winged stem v, which passes upwardly through and is guided in the tubular stem r of the main valve. A seat is formed for the valve u in the lower end of the tubular stem r. A spring w, held in a socket formed therefor in the lower section a of the valve-case, presses upwardly against the valve u and tends to close it.

The lower end of the stem p is enlarged and formed with a recess, and in this recess is loosely fitted a diaphragm-plate x, the stem y of which is guided at its upper end in a sleeve z, threaded and adjustable in the upper end of the stem p. A spiral spring 1, surrounding the stem y and bearing at its upper end against the sleeve z and at its lower end against the plate x, tends to force the latter downward.

2 is a flexible diaphragm clamped at its outer edge to the rim or flange around the lower enlarged end of the stem p by an internally-threaded flanged ring 3 and an externally-threaded annular nut 4, engaging with said ring and bearing on the upper face of the enlargement at the lower end of the stem p. The ring 3 is formed, as shown in Figs 1, 2, and 5, with an open bridge or cross piece 5 below the diaphragm 2, and in the opening of this bridge-piece an elongated nut 6 is loosely fitted and screwed upon a centrally-threaded projection on the under side of the plate x, so as to clamp the diaphragm centrally to said plate, one or more washers being interposed between the nut and diaphragm, as shown in Figs. 1 and 2. The threaded projection on the under side of the plate x bears normally against the upper end of the stem v of the feed-valve. The ring 3 is formed on the under side, as shown in Fig. 5, with lugs 7, which engage with lugs 8, formed on the upper side of the valve q, as shown in Figs. 2 and 4, for turning said valve with the stem p and at the same time allowing the valve to freely adapt itself to its seat. A pin 9, projecting laterally from the lower enlarged end of the stem p and engaging with a slot in the ring 3, as shown in Fig. 1, and a pin 10, projecting upwardly from the valve q and engaging with a hole in the ring 3, as shown in Fig. 2, insures the assemblage of the several parts in the proper relation to each other.

The upper protruding end of the stem p is squared and provided with an operating-handle 11, which has a spring-actuated detent 12, adapted to press against a notched flange 13 at the upper end of the neck o on the cap of the valve-case and to determine lap and service positions of the main valve by engagement with shoulders on said flange. A projection 14 on the handle 11, passing under the flange 13 on the cover of the valve-case, retains the handle in place on the valve-operating stem p and prevents its removal, except when the projection is brought opposite a notch 15 in said flange and the main valve is on lap between release or running and service positions.

With the exception of the construction and arrangement of parts at the lower end of the valve-operating stem p the device as hereinbefore described is substantially like that shown and described in my former patent.

16 is a push-pin for manually depressing the diaphragm-plate x and opening the feed-valve u. It is guided at its lower end in the sleeve z and at its upper end, which is reduced, in a cap or plug 17, threaded in the upper end of the stem p. At its upper protruding end it is provided with a head or button. It is formed or provided with a valve 18, which is adapted to close upwardly against a seat in the lower end of the plug or cap 17.

The cap c of the valve-case is formed on the face against which the enlarged lower end of the stem p bears, as shown in Figs. 1, 2, 3, and 4, with ports 19 and 20, communicating, respectively, with the main-valve chamber or the space between the enlarged end of the stem p and the cap c and with the space between the stem p and the neck o of said cap. A port or passage 21 is also formed through the lower end of the stem p from the diaphragm-chamber to the face of the valve-case in which the ports 19 and 20 are located. This port or passage 21 is so arranged that it will register with the port 19 when the main valve is in service position, as shown in Fig. 1, and with the port 20 when the main valve is in running position, as shown in Fig. 2.

My improved valve mechanism operates as follows: When the main valve is turned by the engineer into service position and the port 21 is thus brought opposite the port 19, as shown in Figs. 1 and 3, compressed air will flow from the main-valve chamber or the space above the main valve through said ports into the diaphragm-chamber above the diaphragm 2. This will balance the train-pipe pressure on the under side of the diaphragm and allow the spring 1 to open the feed-valve u by the engagement of the projection on the under side of the plate x with the stem v of said valve. Upon the admission of compressed air into the diaphragm-chamber and the hollow stem p the valve 18 will be closed upwardly against its seat in the plug or cap 17, and thereby prevent the escape of air to the atmosphere around the push-pin 16. If now after making a service application of the brakes and a slight reduction in train-pipe pressure the engineer turns the main valve back into lap position, the compressed air admitted to the diaphragm-chamber above the diaphragm will be retained in said chamber, counteracting the pressure on the under side of said diaphragm, and the spring 1 will still hold the feed-valve u open. Under these conditions the pressure in the main-valve chamber or the space above the main valve will be the same as that in the main reservoir; but as soon as the main valve is returned to release and running position the port 21 will register with the port 20, as shown in Figs. 2 and 4, and the com-

pressed air contained in the diaphragm-chamber and the tubular stem p above the diaphragm will be allowed to gradually escape through the slight clearance-space between said stem and the neck o of the cap. This escape of air will, however, be comparatively slow, and there being free communication between the train-pipe and the main reservoir through the ports and passages h, k, m, and j, the feed-passage in the tubular stem r, and the port g, the feed-valve u still being held open, the pressure in the train-pipe will be promptly augmented and restored and the brakes will be positively and promptly released without manually opening the feed-valve or a by-pass between the main reservoir and train-pipe and without further care or attention on the part of the engineer. The push-pin 16 or other means for manually opening the feed-valve may thus be dispensed with; but I consider it advisable to retain it as a safeguard in case of emergency.

Various changes in minor details of construction and arrangement may be made within the scope of my invention to adapt my improvements to various forms of engineer's valves of the class to which the invention is applicable.

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 the supply and release of fluid-pressure to and from the train-pipe, means for manually operating said valve, an automatic feed-valve for restoring and maintaining the desired pressure in the train-pipe when the main valve is in running position, a movable part exposed on one side to train-pipe pressure, a spring acting on said movable part in opposition to the train-pipe pressure, and tending to open said feed-valve, and a port or passage adapted to be opened and to admit pressure to the other side of said movable part when the main valve is in service position, 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 supply and release of fluid-pressure to and from the train-pipe, means for manually operating said valve, an automatic feed-valve for restoring and maintaining the desired pressure in the train-pipe when the main valve is in running position, a movable part for operating said feed-valve exposed on one side to train-pipe pressure, a spring acting on said movable part in opposition to the train-pipe pressure and tending to open said feed-valve, and means operated by the main-valve-operating means to admit fluid-pressure to the opposite side of said movable part when the main valve is in service position and to release such pressure when the main valve is in running position, substantially as and for the purposes set forth.

3. In an engineer's valve the combination with a main valve directly controlling the supply and release of fluid-pressure to and from the train-pipe, and a handle for operating said valve, of an automatic feed-valve controlling the supply of fluid-pressure to the main valve and adapted to restore and maintain the desired pressure in the train-pipe when the main valve is in running position, a movable part for operating said feed-valve, normally exposed on one side to train-pipe pressure, a spring tending to open said feed-valve and means operated by said handle for admitting pressure to the opposite side of said movable part when the main valve is in position to apply the brakes, substantially as and for the purposes set forth.

4. In an engineer's valve the combination with a main valve directly controlling the supply and release of fluid-pressure to and from the train-pipe and a handle for operating said valve, of an automatic feed-valve for restoring and maintaining the desired pressure in the train-pipe when the main valve is in running position, a movable part for operating said feed-valve normally exposed on one side to train-pipe pressure, and means operated by said handle for admitting pressure to the opposite side of said movable part when the main valve is in a certain position and releasing such pressure when the main valve is in another position, substantially as and for the purposes set forth.

5. In an engineer's valve the combination with a main valve controlling the supply and release of fluid-pressure to and from the train-pipe and a handle for operating said valve, of an automatic feed-valve adapted to restore and maintain the desired pressure in the train-pipe when the main valve is in running position, a movable part normally exposed on one side to train-pipe pressure for operating said feed-valve, a push-pin for manually operating said movable part and opening said feed-valve provided with a valve for closing the opening in the valve-case through which said pin projects, and means operated by said handle for admitting pressure to the opposite side of said movable part and closing the valve on the push-pin when the main valve is in a certain position and releasing such pressure when the main valve is in another position, substantially as and for the purposes set forth.

6. In an engineer's valve the combination with a valve-case having main-reservoir and train-pipe connections and an exhaust-port and a main valve controlling the supply and release of fluid-pressure to and from the train-pipe, of an automatic feed-valve for restoring and maintaining the desired pressure in the train-pipe when the main valve is in running position, a stem for operating said main valve fitted to turn in said case and provided with a movable part which is normally exposed on one side to train-pipe pressure and with a port which is adapted to register with ports

in the valve-case and to admit pressure to the other side of said movable part when the main valve is in service position and to gradually release such pressure when the main valve is in running position, and a spring acting on said movable part in a direction tending to open said feed-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-port and a main valve for controlling the supply and release of fluid-pressure to and from the train-pipe, of an automatic feed-valve for restoring and maintaining the desired pressure in the train-pipe when the main valve is in running position, a tubular stem for operating said main valve, fitted to turn in said case and provided with a movable part which is normally exposed on one side to train-pipe pressure and with a port which is adapted to register with ports in the valve-case and to admit pressure to the other side of said movable part when the main valve is in service position and to gradually release such pressure when the main valve is in running position, a spring acting on said movable part in a direction tending to open said feed-valve, and a push-pin for manually operating said movable part and opening said feed-valve, provided with a valve which is adapted to close the opening through which said pin passes when pressure is admitted into said tubular stem, 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:
CHAS. L. GOSS,
MAUDE L. EMERY.