G. H. CLEMENS.

Relief-Valves.

No. 165,791. Patented July 20, 1875.

Fig. 1

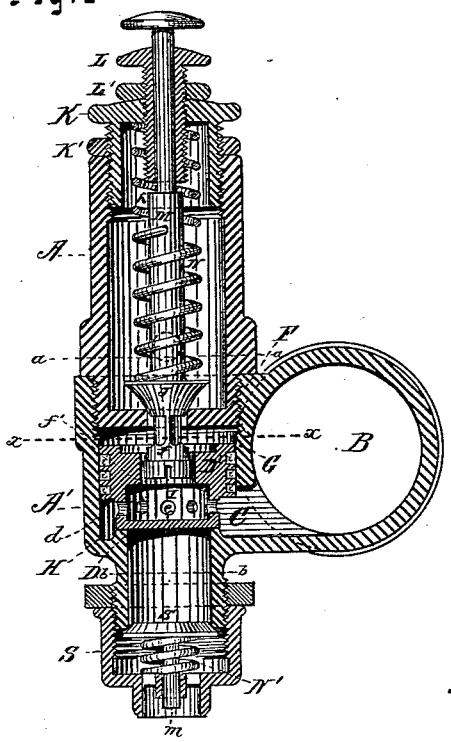


Fig. 2

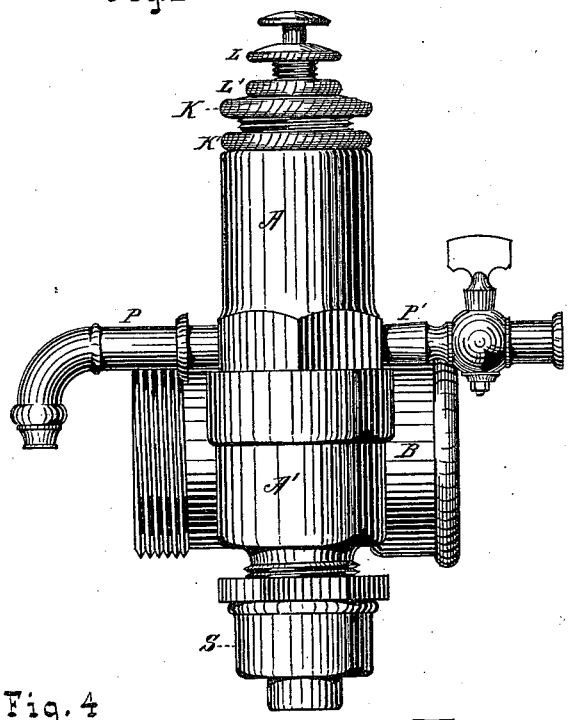


Fig. 3

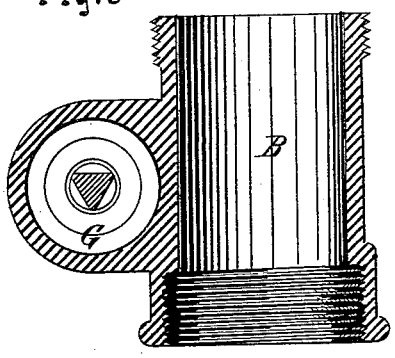
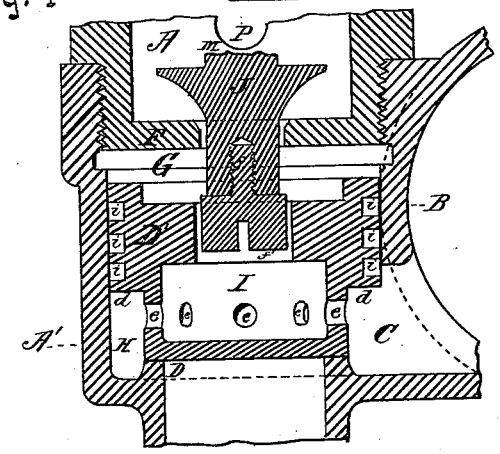


Fig. 4



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UNITED STATES PATENT OFFICE.

GILBERT H. CLEMENS, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN RELIEF-VALVES.

Specification forming part of Letters Patent No. **165,791**, dated July 20, 1875; application filed April 17, 1875.

To all whom it may concern:

Be it known that I, GILBERT H. CLEMENS, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Relief-Valves; and I do hereby declare the following to be a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawing forming part of this specification, in which—

Figure 1 is a vertical central section of a relief-valve embodying my said invention. Fig. 2 is a side elevation of the same. Fig. 3 is a sectional plan taken on the line *x x* drawn across Fig. 1; and Fig. 4 is an enlarged vertical central section of a portion of the same, between the lines *a b* drawn across Fig. 1.

Similar letters of reference indicate like parts in the several figures of the drawing.

The object of my present invention is to improve the safety-valve for which I obtained Letters Patent February 28, 1871, to more perfectly adapt it for use as a relief-valve for fire-engines; and to that end it consists, first, in the arrangement of the main valve whereby the same is opened and closed by the pressure of water; second, in the means employed for depressing the primary valve to determine the pressure of the main valve against the direct action of the volume of water in the hose; third, in the arrangement of check-valve whereby the main valve is prevented from being lifted off its seat by the back pressure of water from the supply-chamber when the engine is at rest.

In the drawing, A represents the upper portion of the valve-case, and A′ the base or lower portion, which are of about equal lengths, and screwed together, as shown in Figs. 1 and 4. B is a cylindrical coupling, which is made as a part of the base A′, and arranged horizontally across the same. One end of this coupling is attached to the end of the eduction-pipe of the pump, (not shown,) and the other end to the end of the hose, by which means the former is so connected to the latter as to provide an unobstructed passage through them. The central portion of this coupling is provided with a port, C, communicating with the cavity of base A′ of the case. The diameter of the lower portion of the cavity of base A′ is less than the diameter of its upper portion, forming an upward-projecting flange, D, the latter terminating at a point slightly above and in close proximity to the base of port C, forming the seat of the main valve D′. The lower end of the part A of the case is provided with an inwardly-projecting rim or flange, forming a bulk-head, F, located at a point slightly above the upper surface of the main valve D′. The arrangement of this bulk-head is such as to form a chamber, G, between it and the upper surface of the main valve, as shown in Figs. 1 and 4. The lower portion or base of valve D′, at its seat, is less in diameter than its upper portion, forming an overhanging flange, *d*, the object of which is to provide a greater area of space in chamber G than the area of the valve-seat proper, and to form an annular chamber, H, around the base of the valve, into which the valve passes through inlet-port C, consequently providing an area against which the upward pressure of water underneath the valve acts to lift the latter off its seat. The base of the valve is provided with a cylindrical chamber, I, which communicates with chamber H through a series of openings, *e*, formed in the wall of chamber I, as shown in Figs. 1 and 4, through which openings the water passes into the latter chamber. J is a primary valve, which is arranged within the lower end of the part A of the case, and so arranged as to admit of a slight vertical movement. This valve is seated within and upon the upper surface of bulk-head F, and is provided at its lower end with a depending stem, *f*, extending downward through the bulk-head into and partially through an aperture, *f′*, formed centrally through the main valve D′. The lower end of this stem is slightly enlarged, exceeding in diameter the diameter of the base of the primary valve, and is so fitted within aperture *f′* as to provide an annular space between its enlarged portion and the wall of the aperture, through which the water passes from chamber I of the main valve into chamber G. Affixed to and within the upper end of the part A of the case is a cap, K, which is so arranged as to admit of being raised or lowered as may be required, and firmly secured at any adjusted point by

means of a lock-nut, K′, mounted on the depending portion of the cap, and adapted to bear against the upper end of the case. Centrally secured within this cap is a sleeve, L, which is also so arranged as to admit of being raised or lowered, and firmly secured at any adjustable point by means of a lock-nut, L′, mounted on the threaded portion of the sleeve, and adapted to bear against the upper surface of the cap. Permanently attached to the upper surface of the primary valve J is a stem, M, which extends upward through sleeve L, as shown in Fig. 1. N is a coiled spring, which is loosely secured around the valve-stem M between the upper surface of the valve and lower surface of cap K. The arrangement of this spring is such as to held the valve firmly in its seat, and its impact against the pressure of water under the lower end of stem *f*, and the face of the primary valve, is determined by raising or lowering cap K, so as to increase or decrease the tension of the spring. The upper portion of stem M of the primary valve is so reduced as to form a shoulder, *h*, immediately below the end of the sleeve, and adapted to bear against the sleeve when the primary valve is raised, the object of which is to limit the ascent of the primary valve; also, to provide a means for holding the primary valve rigidly on its seat when desired, which is accomplished by screwing the sleeve downward firmly against the shoulder. Attached to the side of part A of the case, and communicating with the interior of the same, is an eduction-pipe, P, through which the water passes from the part A as it enters the latter when the primary valve is raised. Permanently attached to the part A of the case, and also communicating with the interior of the same, is an induction-pipe, P′, through which steam may be admitted into the case to relieve the operating parts of the valve should the same become frozen. S is a cylindrical coupling, which is attached to the lower extremity of the part A′ of the valve-case. Permanently attached to the lower extremity of this coupling is a discharge-pipe, (not shown,) which communicates with the supply-chamber, and through which the column of water passes back into the chamber when the main valve is lifted off its seat. S′ is a check-valve, which is located within coupling S, and so arranged as to bear against the lower end of part A′ of the valve-case which forms its seat. Attached to the lower surface of this valve is a depending stem, *m*, which passes loosely through a cross-head permanently attached to the inner surface of the coupling. N′ is a coiled spring, which is loosely secured around stem *m*′ between the upper surface of the cross-head and the lower surface of the valve.

The tension of this spring is such as to hold the valve against its seat when pressure is relieved from the upper surface of the valve; but to yield with the impact of water and allow the valve to open when the main valve is lifted off its seat, so as to allow the volume of water to enter the case through port C.

The object of this valve is to prevent the back pressure of the water in the supply-chamber from lifting the main valve off its seat when the engine is temporarily stopped, as would be the case when the water was being supplied from the common fire-plug, if allowed to come in contact with the lower and exposed area of the main valve.

The periphery of the main valve is provided with a series of annular grooves, *i*, within which may be secured suitable packing, adapted to bear against the inner surface of the case, by which means the requisite water-tight joint is obtained.

The operation of my invention is as follows: When the engine is set in motion, the volume of water is taken from the supply-chamber of the pump in the usual manner, and as it is forced through coupling B into the base a portion of it flows into chamber H of the case through port C, and from said chamber into chamber I of the main valve D′ through openings *e*, filling said chamber. The water in said chamber then passes through opening *f*′ in the main valve around the enlarged portion of the primary valve-stem *f* into chamber G above the main valve, filling said chamber, and the pressure of water in said chamber overbalances the pressure of the water in chamber H against the overhanging flange *d* of the main valve, which holds the latter firmly on its seat. Spring N of the primary valve is adjusted to produce a pressure on said valve per square inch equal to the pressure per square inch the hose is intended to carry, and when the pressure in the hose exceeds the limit of the working pressure, the primary valve is raised off its seat by the excess pressure of water against the lower end of stem *f*, which allows the water in chamber G to escape through the opening in the bulkhead around the valve-stem, thereby reducing the pressure against the upper surface of the main valve sufficient to cause the constant pressure beneath the same to overbalance that above, by which means the main valve is raised off its seat, and the volume of water passes through port C under said valve, and is discharged back into the supply-chamber through the discharge-pipe. As soon as the pressure within the hose is reduced sufficiently to be within the limit allowed, the tension of the spring N overbalances the pressure against the lower end of stem *f*, causing the primary valve to reseat, and chamber G instantly fills, loading the main valve, causing it to reseat.

Having thus described my invention, I claim—

1. In combination with chamber G, the valve D′, provided with flange *d*, arranged to form the chamber H around the base of the valve, the chamber communicating with chamber G through chamber I and aperture *f*′ around the enlarged portion *f* of the primary valve-stem, as specified.

2. In combination with cap K and spring N, the adjustable sleeve L loosely arranged upon stem M of the primary valve, and adapted to bear upon shoulder *h* of the latter to limit the ascent of the primary valve, or to depress and hold the same in its seat without changing the tension of spring N, as specified.

3. In combination with valve D′, arranged to operate as described, the check-valve S′, seated on the lower end of part A′ of the valve-case within coupling S, and arranged to prevent valve D′ from being lifted off its seat by the back pressure of water, as specified.

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