A. F. Allen,

Relief Valve.

No. 113,829. Patented Apr. 18. 1871.

Fig. 1.

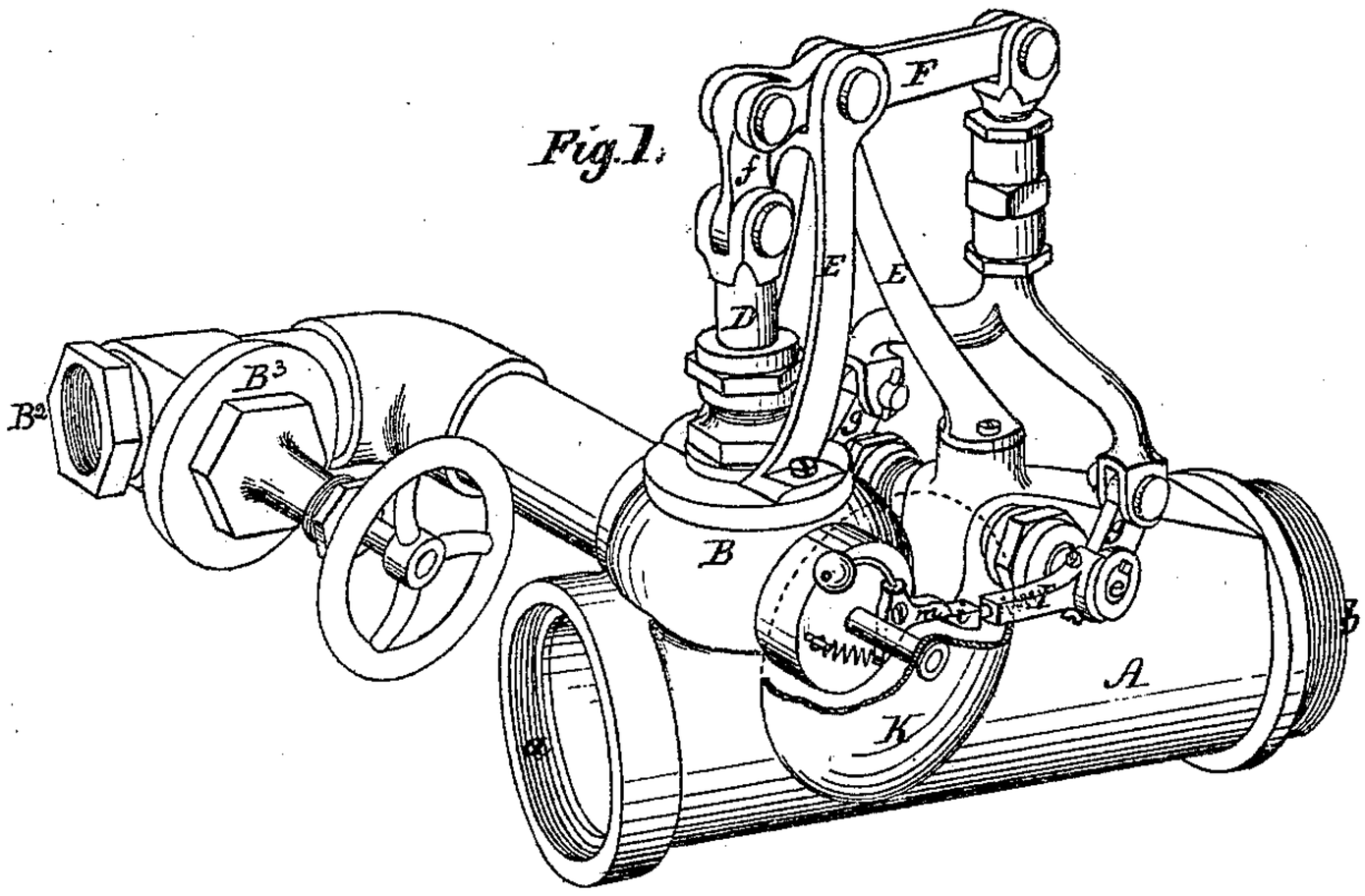


Fig. 2.

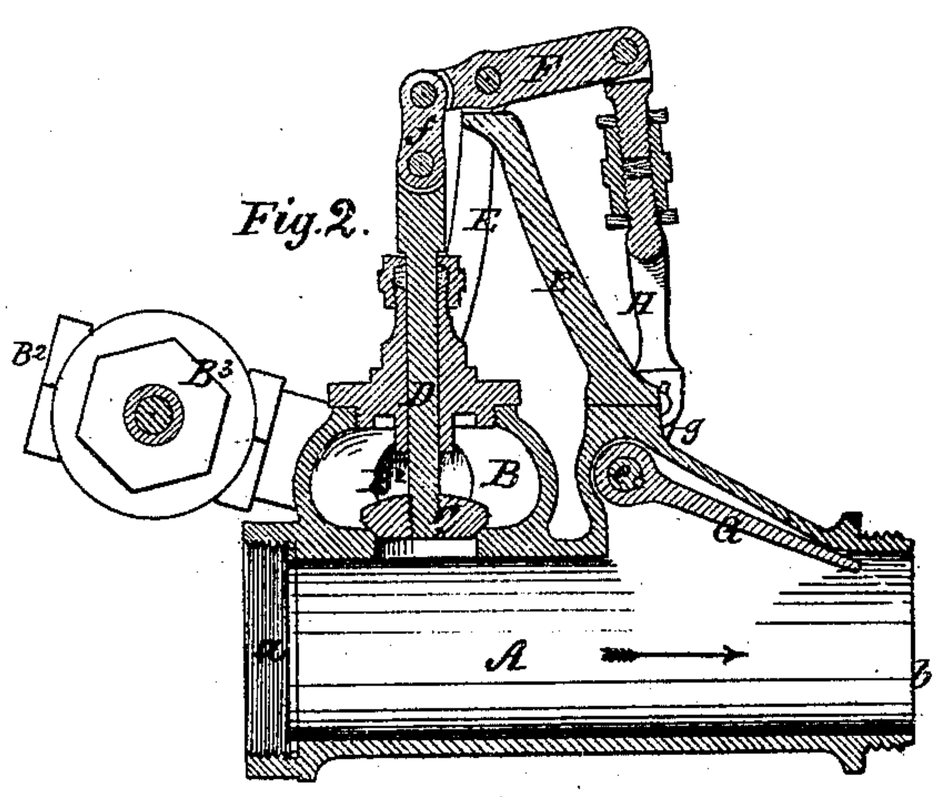
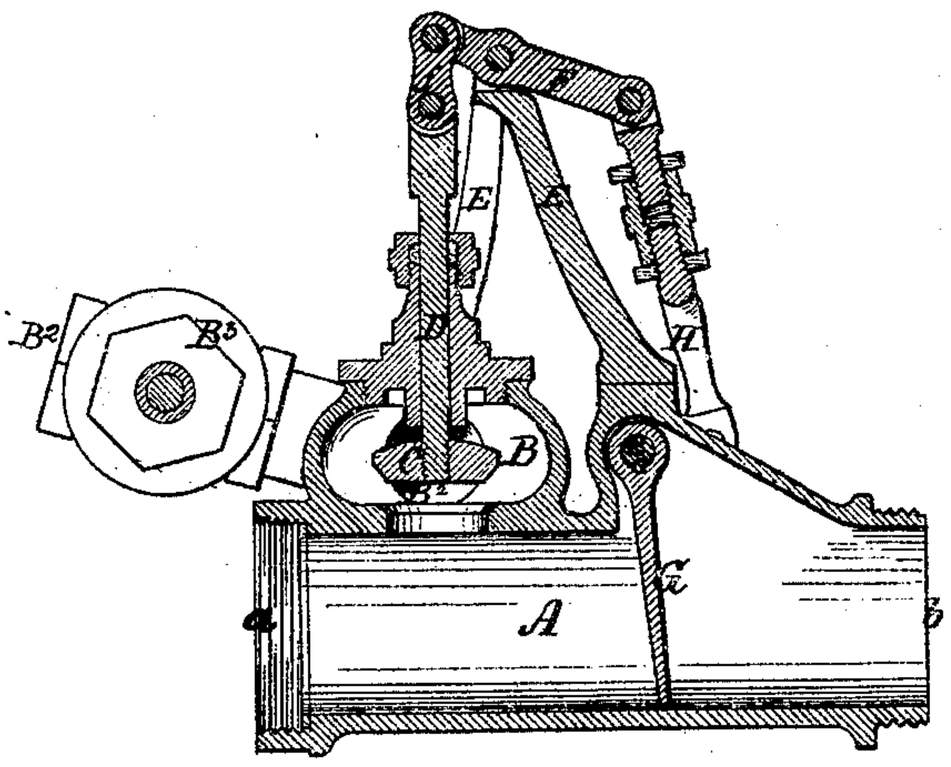


Fig. 3.



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UNITED STATES PATENT OFFICE.

ALBERT F. ALLEN, OF PROVIDENCE, RHODE ISLAND.

IMPROVEMENT IN AUTOMATIC RELIEF-VALVES.

Specification forming part of Letters Patent No. **113,829,** dated April 18, 1871.

To all whom it may concern:

Be it known that I, ALBERT F. ALLEN, of the city and county of Providence, in the State of Rhode Island, have invented a certain new and useful Automatic Relief-Valve for Fire-Engines, Force-Pumps, Hydrants, &c.

My invention consists in part of combining a relief-valve with a hydraulic lever, or its equivalent, in such a manner that, first, the relief-valve will be kept closed by the current of water as it flows, under pressure, acting upon the lever; and, second, the relief-valve will be free to open instantaneously, if, while the pressure continues, the current of water should, from any cause, be checked or suspended.

My invention further consists in combining with such an apparatus a signal-bell, by means of which a system of communication may be established between the hoseman at the end of a line of hose and the engineer or person in charge of the fire-engine, pump, or hydrant; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a clear, true, and exact description thereof.

Referring to the drawings, Figure 1 represents my automatic relief-valve in perspective. Fig. 2 represents the same in longitudinal vertical section with the relief-valve closed. Fig. 3 represents the same with the relief-valve open.

A represents the main chamber of the relief-valve. It is connected at the opening *a* with the base of the air-chamber of a pump or with a hydrant. All water forced from the pump or hydrant under pressure passes through this chamber in the direction of the arrow in Fig. 2. The hose or pipes for conveying the water under pressure are connected to the main chamber at *b*.

B is the auxiliary chamber of the relief-valve. It communicates with the interior of the main chamber, and also with the suction-chamber of a pump, or the barrel of a hydrant, through suitable pipes connected at the opening B^2. If connected to the suction-chamber of a pump, a tight-valve, B^3, must be interposed between, in order that the connection may be perfectly cut off during the drawing of water when the operation of pumping is commenced. Once in operation, the valve should then be opened.

C is the relief-valve proper. In this instance it consists of a plain piston-valve with a common ground seat. It will be observed that it is interposed between the main and auxiliary chambers. When the valve, as a whole, is connected with the source of supply, under pressure, it will be observed, if the valve be opened, that a direct communication takes place between the main and auxiliary chambers and the several parts of the pump or hydrant to which the openings *a* and B^2 are connected.

D is the valve-rod of the relief-valve. It passes upward through the dome of the auxiliary chamber B, and is provided with a suitable stuffing-box.

E is a pronged standard, mounted upon the dome of the auxiliary chamber.

F is a lever, pivoted to the top of the standard E. Its fulcrum in this instance is fixed at one-third of its whole length from one of its ends. The short end of this lever is connected with the upper end of the valve-rod D by means of a short rod, *f*.

G is a hydraulic lever. It is keyed at its upper end to a shaft, *e*, which passes through the upper part of an enlarged portion of the main chamber, and at right angles thereto. This shaft *e* is provided with suitable stuffing-boxes, which, while they should permit of a free semi-rotary movement of the shaft, should also be sufficiently well set to prevent the passage of water along the shaft. On each end of this shaft *e* are the arms *g*, set thereon at right angles to the lever G. It will be observed that the arms *g*, shaft *e*, and lever G constitute, as a whole, one lever, with the fulcrum at the bearings of the shaft *e*.

H is a forked connecting-rod. The two lower or forked ends are pivoted to the outer ends of the two arms *g* of the shaft *e*. The upper end of this rod is pivoted to the long end of the lever F. For the purpose of lengthening or shortening the rod H, when desired, it is constructed in two parts, which are connected by a hollow sleeve provided with a right and left hand screw, and arranged in a manner well known to persons skilled in the art.

I is a latch-lever, secured to one end of the shaft *e*, at an angle oblique to the line of the

arms *g*. In the free end of this lever is a spring-latch, *i*, of ordinary construction.

Attached to the exterior of the main chamber is a gong or bell, K, provided with a spring-hammer mounted upon a pivot at or near the hub of the bell in a well-known manner.

The handle of the spring-hammer, designated in the drawing as *m*, is so set with relation to the latch *i* of the latch-lever that as the latch swings downward its inclined plane causes it to freely pass over the handle *m*. As it swings upward, however, the latch engages with the handle, causes the hammer to swing off from the bell until the latch passes, when the hammer strikes the bell actuated by its own spring.

It will be observed that the vibrating of the hydraulic lever G will cause the bell to sound at every complete vibration. It will also be observed that the bell is sounded at every reciprocating vertical movement of the valve-rod D, and that in operation it is the opening of the valve which causes the bell to sound.

Having thus described the several parts of my automatic relief-valve, I will now explain its operation. For the purpose of illustration it is to be presumed that the apparatus is attached to a steam fire-engine. The openings *a* and B^2 having been connected, as already described, to the pump and suction-chamber, respectively; also, hose is attached to the opening *b* in a line of, say, five hundred feet, upon starting the engine, if it is to draw its water by suction, it will be necessary to close the valve B^3 in order to prevent any induction of air from the relief-valve while the pump is being charged. As soon as water is flowing to the hose this valve should be opened wide. If the water is discharged at the hose-pipe, and therefore flows rapidly through the main chamber A in the direction of the arrow in Fig. 2, the force of the current will cause the hydraulic lever G to swing with the current, thereby elevating the connecting-rod H and the long end of the lever F, which in turn depresses the valve-rod D, and holds the relief-valve closely to its seat.

It is to be observed that the system of leverage shown and described is such that a light lateral force expended upon the hydraulic lever G results in a largely-multiplied vertical force or pressure upon the valve-seat. Assuming that the engine was discharging water at the hose-pipe, and that a necessity therefor no longer existed, that the hose-pipe or hose adjacent thereto was provided with a stop-valve which was arranged to cut off the water instead of discharging it through the hose or pipe, and that the hose-man should cut off the water; as soon as the current of water ceased to flow in the main chamber A no force would be exerted upon the hydraulic lever G. The expansive force of the water in the chamber, which had meantime been directed against the relief-valve proper, would then be free to open it, allowing the water to pass from the main chamber, through the valve, back to the suction-chamber of the pump, and thus circulate without injury to pump or hose.

The capacity of the relief-valve should be somewhat greater than the delivery capacity of the several hose-pipes to be employed. Whenever the opening of the relief-valve thus occurs the bell is sounded, giving the engineer in charge correct knowledge of what has been done at the end of the line of hose. Whenever the stop-valve in the hose or at the hose-pipe is opened and the discharge of water resumed, the current acts upon the lever G and promptly closes the relief-valve. By a prearranged system of bell-signals the hose man may communicate with the engineer, and call for more water or less, as may be desired, or for personal assistance in cases where the hose men have entered burning buildings at a distance from the engine.

A practical test of my automatic relief-valve disclosed the fact that there was actually less pressure on the hose immediately after cutting off the water than before, while the water was being regularly discharged through the hose-pipe. This is owing partly to the fact that there is a greater capacity for discharging by the way of the relief-valve than by the hose pipe, and partly to the fact that the lever G is in no way affected by the force of compressed water, but by its momentum only.

If during the operation of the fire-engine any weight should be placed on the hose, as is instanced by running over it with another engine or hose-cart, there exists no danger of its bursting, as the relief-valve opens instantaneously with the checking of the current of water in its passage through the main chamber, and is immediately closed when the flowing is resumed.

Relief-valves as heretofore constructed have been controlled by pressure only, thereby necessitating the use of latches, springs, and weights. My automatic relief-valve differs from all heretofore known in the application of current-power, or the momentum of water flowing under pressure, for keeping the relief-valve closed during the continuance of the flow, and permitting it to open by pressure when the flowing ceases.

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

1. The combination of a hydraulic lever and a relief-valve, when the two are so connected and arranged that a current of water flowing under pressure, by acting upon the lever, will hold the relief-valve to its seat, substantially as described.

2. The combination of the relief-valve and signal-bell, the two being so connected and arranged that the opening or closing of the valve will cause the bell to sound, as and for the purposes specified.

3. The combination of the hydraulic lever

G and signal-bell, substantially as described, the two being so connected and arranged that the bell will be sounded by the vibration of the lever when moved by the force of a current of water, as and for the purposes specified.

4. In combination with the auxiliary chamber of an automatic relief-valve, the valve B^3, set between it and the suction-chamber of the pump, for the purpose of preventing the induction of air by the way of the relief-valve while the pump is being charged, substantially as described.

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