ALBERT F. ALLEN.

Improvement in Relief Valves.

No. 120,925. Patented Nov. 14, 1871.

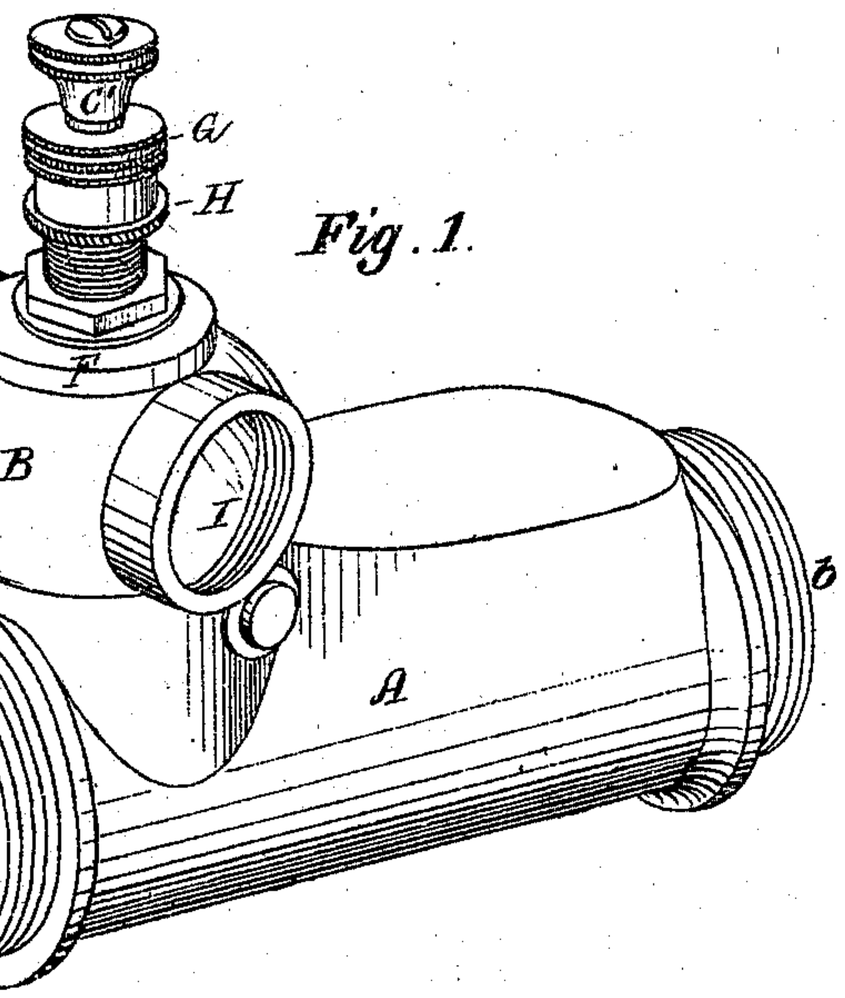

Fig. 1.

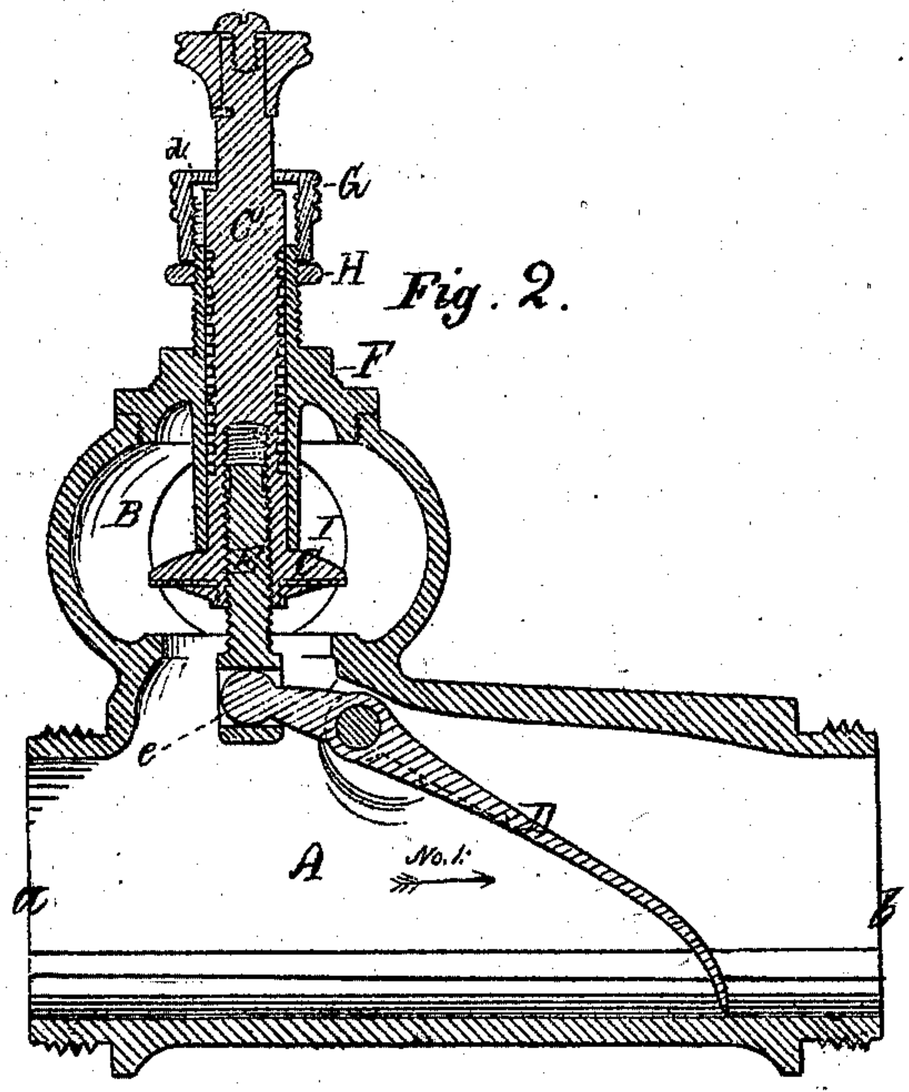

Fig. 2.

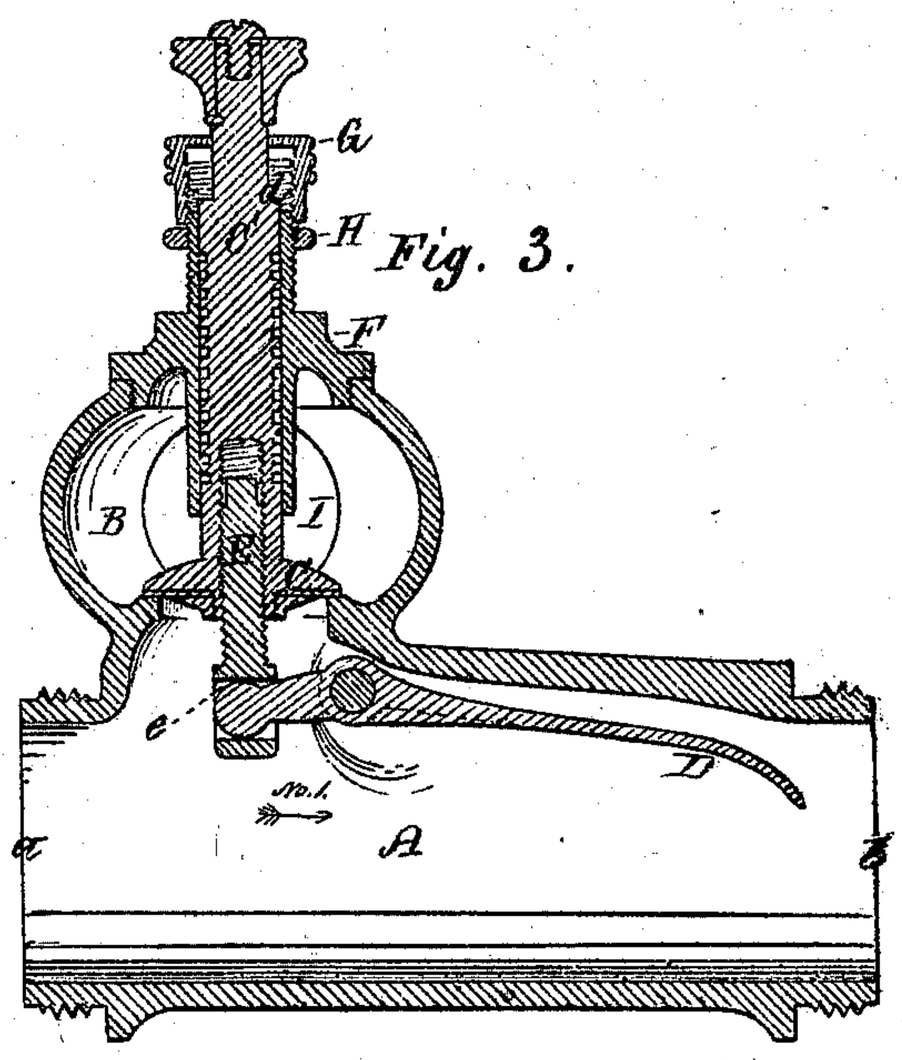

Fig. 3.

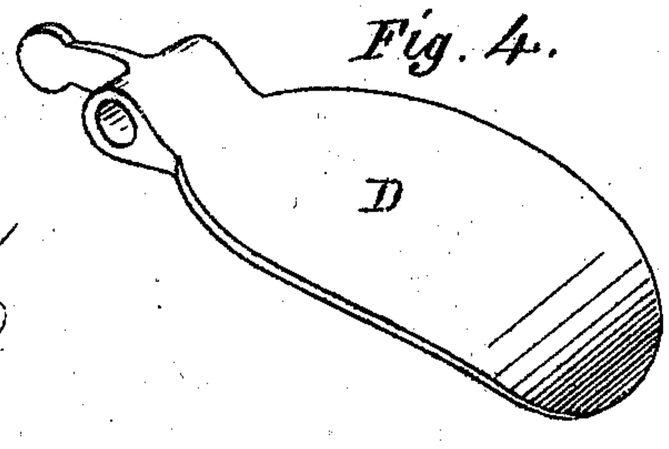

Fig. 4.

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120,925

UNITED STATES PATENT OFFICE.

ALBERT F. ALLEN, OF PROVIDENCE, RHODE ISLAND.

IMPROVEMENT IN AUTOMATIC RELIEF-VALVES.

Specification forming part of Letters Patent No. 120,925, dated November 14, 1871.

To all whom it may concern:

Be it known that I, ALBERT F. ALLEN, of the city and county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Automatic Relief-Valves for Fire-Engines, Steam-Pumps, &c., of which the following is a specification:

My present invention is particularly applicable to the relief-valve patented by me, April 18, 1871; and it consists partially in so combining a relief-valve with a hydraulic-lever that the connections will be within the main chamber, and thereby render it possible to dispense with stuffing-boxes or packing; second, in so forming the hydraulic lever that it will offer a greater degree of resistance in all positions to the passing current flowing through the main chamber, and therefore giving it more power with which to control the relief-valve; third, in providing an independent means for controlling the relief-valve proper, by reason of which an intermediate valve between it and the pump may be dispensed with during the operation of raising water by suction; fourth, in a novel method of adjusting the hydraulic lever with relation to the valve so that it will have much or little power over the valve as may be desired; and fifth, in providing a packing for the relief-valve stem, which will render it air and water-tight without occasioning any undue friction upon the stem, and which will require no adjustment from time to time and be self-lubricating; and I do hereby declare that the following specification, taken in connection with the drawing furnished and forming a part of the same, is a clear, true, and exact description of a relief-valve embodying my several improvements.

Referring to the drawing, Figure 1 represents one of my improved valves in perspective. Fig. 2 represents the same in longitudinal vertical section with the relief-valve open. Fig. 3 represents the same as in Fig. 2, with the relief-valve closed. Fig. 4 represents the hydraulic lever in perspective.

A represents the main chamber of the valve. It is connected at the end *a* with a pipe leading to the interior of the base of the air-chamber of the pump with which it is to be used. All water passing from pump to hose flows through this chamber in the direction of the arrow No. 1. B represents the auxiliary-chamber of the relief-valve. It communicates with the interior of the main chamber A, and also by a pipe with the suction-chamber of the pump through the port I. C represents the relief-valve proper; it controls the opening between the chambers A and B. In this instance the valve and its stem C are constructed of one piece of cast metal. The stem is turned down to two diameters; there being at *d* a shoulder above which the stem is smaller than it is below that point. The top of the stem is so formed that it can readily be grasped and turned by the hand. For the purpose of rendering the relief-valve stem air-and-water-tight in its sleeve it is provided with several circumferential recesses, as clearly shown in the drawing. After using the valve in the usual manner these recesses become charged with water, which not only thoroughly packs the stem but lubricates it. No friction is created, nor is any adjustment of packing requisite from time to time. Similar recessed spaces have been long in use in connection with the pistons of pumps and steam-engines; and I do not therefore broadly claim them. Such recesses, however, have never before my invention, to my knowledge, been employed in connection with a valve-stem or piston-rod. In a relief-valve it is desirable that the action of the valve be as free as possible, and at the same time be not only water-tight but air-tight, as will be hereafter more fully explained. D represents the hydraulic lever, which is pivoted to the upper-side walls of the main chamber A. The long end of the lever is fan-shaped, as shown in Fig. 4, and when down completely fills the circumferential outline of the chamber A. As heretofore constructed this lever was straight from the pivot to the long end; with a system of levers, as shown in my former patent, the current exercised sufficient force against the lever to enable it to control the relief-valve. With the long end of the lever curved, substantially as described, a greater surface is exposed to the current, and at an angle more nearly "right" to the longitudinal central line of the main chamber than if straight, and therefore a lever so curved can exercise a greater force in holding the valve to its seat. It is essential, owing to the direct connection of the lever to the valve, that as much current power be used as can possibly be employed without materially obstructing the main chamber. E represents a screw-spindle, which

enters a longitudinal-threaded recess in the valve-stem C′ passing through the center of the valve C. The lower end of this spindle is provided with a vertical central slot, *e*, of sufficient capacity to freely receive the short end of the hydraulic lever. F represents the cap of the auxiliary-valve chamber; it is provided with a sleeve which projects down into the interior of the chamber, and upward above the outside face of the cap. Its interior is fitted to receive the valve-stem C′ at its largest diameter. The lower end of this sleeve serves as a stop to the upward movement of the valve. The upper end of the sleeve has an exterior screw-thread cut thereon. G represents a valve-holding device, which consists, in this instance, of a screw-cap fitted to the upper end of the upper sleeve; through this cap the valve-stem C′ extends, to the smallest diameter of which above the shoulder *d* the top of the cap is fitted. H represents a circular set-nut, fitted to the screw on the sleeve; it is used for securing the screw-cap G in any desired position. I represents the relief-port already referred to in connection with the auxiliary-chamber B.

Having thus described the several parts in detail, I will now explain their operation. For the purposes of illustration it will be assumed that a valve like that herein described is attached to a steam fire-engine, and that water is flowing under pressure from *a* to *b* through the valve from the pump to a line of hose. As shown in Fig. 2, the relief-valve will be held to its seat by the force of the current acting against the curved face of the hydraulic-lever D. So long as the current flows and exercises a certain force upon the lever the valve cannot be opened. Should the current be obstructed in the hose or cut off by a valve at the hose-pipe, the lever exercises no power upon the valve, which is, of course, speedily opened by whatever pressure there may be in the main chamber, and the water passes through the valve and auxiliary-chamber by the way of the port I back to the suction-chamber of the pump, and circulates through and through the pump without causing any strain whatever, either upon the pump or upon any of the adjacent parts, nor upon the line of hose. As soon as the obstruction in the hose is removed, or the valve at the hose-pipe reopened, the current acting upon the lever closes the relief-valve, which so remains until another occasion for its being opened, when the operation will be repeated, as before described. Whenever the pump is drawing water by suction it is, of course, essential that the pump and all its communicating parts should be air-tight. In my original patent I describe and claim an auxiliary valve, which is interposed between the relief-valve and the pump, for the purpose of preventing air from entering the suction-chamber by the way of the relief-valve. With my improvement the relief-valve in itself is capable of performing this function. The screw-cap G, by being turned down so as to bear upon the projection *d* of the valve-stem, so holds the valve to its seat that no air can enter. A great variety of means may as well be employed for holding the valve to its seat. It is evident that the power which the lever D will exert upon the valve in holding it to its seat will depend upon the angle at which the lever rests when the valve is closed—as, for instance, if when the valve is closed the lever is but half raised the current exercises a greater force against it than it would if it were raised to a higher point. I regulate the power of the lever by the screw-spindle E, which is tapped into the valve-stem. By turning the valve-stem the spindle is projected or withdrawn, moving with it the short end of the lever, raising or lowering the long end and holding it firmly at any desired point, without in any manner affecting the relative positions of the valve and its seat. By the screw-cap G the relief-valve can also be limited in its capacity and allowed to open much or little, as desired. When a signal bell is to be attached it can be connected with the valve-stem, substantially as described in my former Letters Patent.

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

1. The relief-valve and hydraulic-lever connected within the walls of the main chamber, as and for the purposes specified.

2. The curved-face lever D, in combination with the relief-valve, as and for the purposes specified.

3. The combination of the relief-valve with the independent valve-holding device for confining the valve to its seat and cutting off communication with the pump during the operation of drawing water, substantially as described.

4. The combination of the valve-stem, screw-spindle, and hydraulic lever, by which the lever may be set at any desired angle by turning the valve-stem, substantially as described.

5. The stem of an automatic relief-valve, its surrounding sleeve and the annular recesses combined and arranged substantially as described, for the purposes specified.

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