(No Model.)

G. B. LAMB.

HYDRAULIC PRESSURE VALVE.

No. 543,772. Patented July 30, 1895.

Fig. 1.

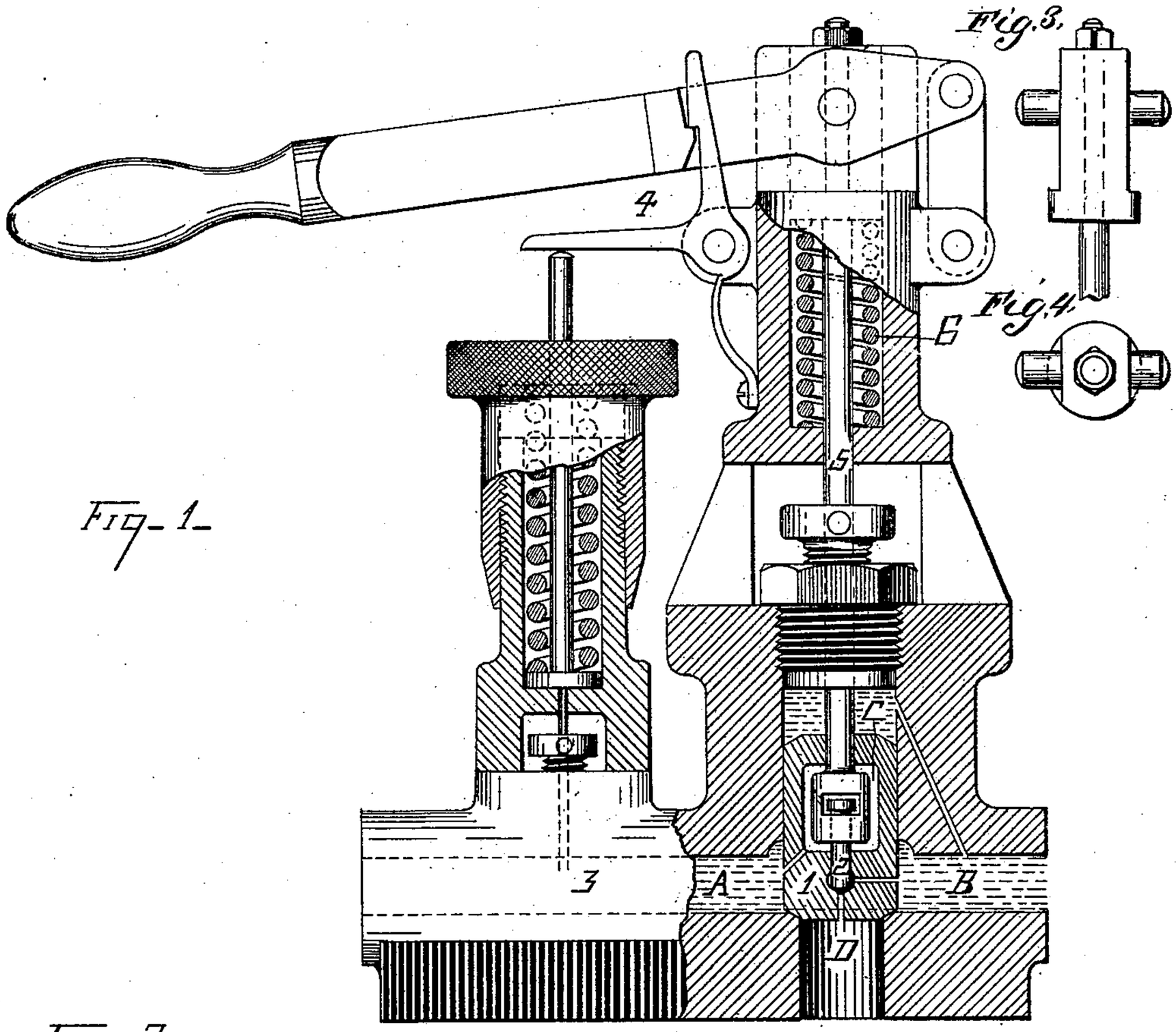
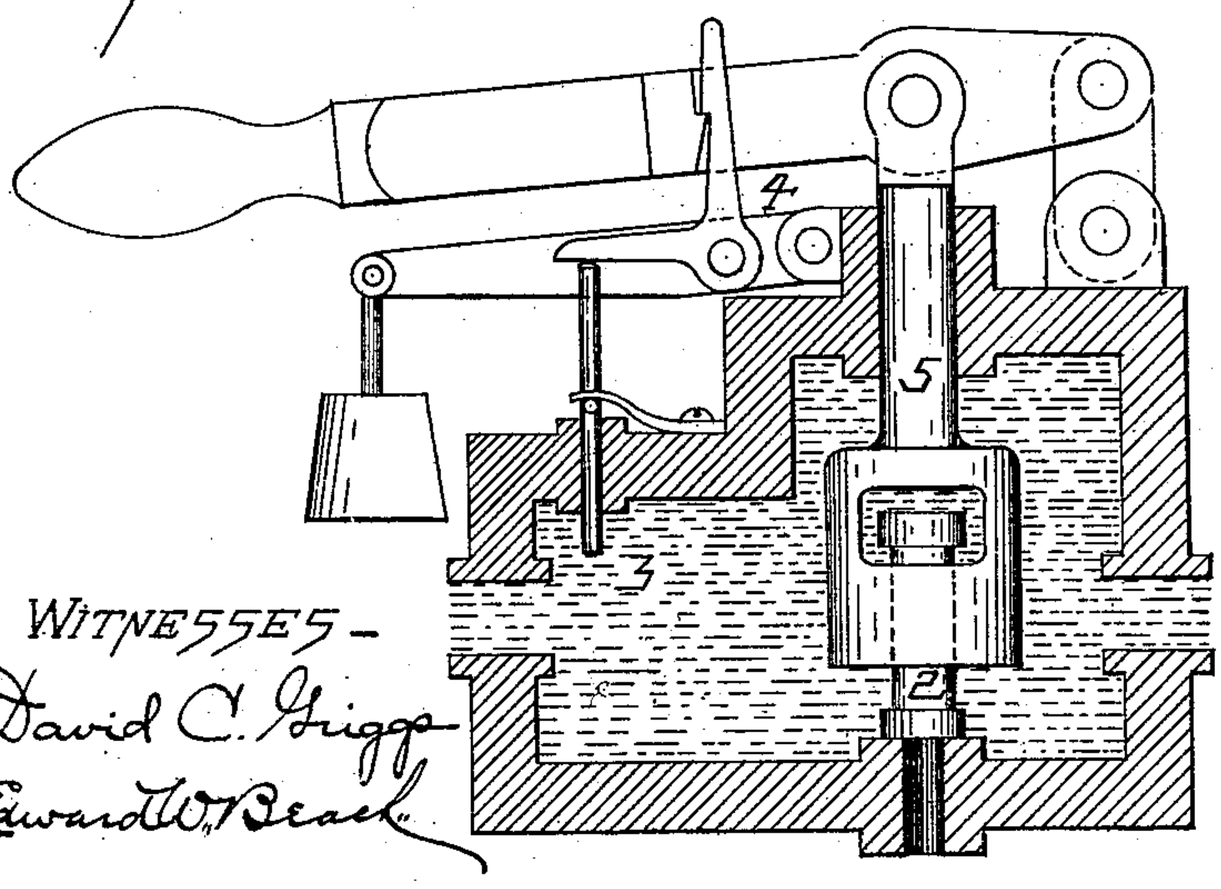


Fig. 3.

Fig. 4.

Fig. 2.



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UNITED STATES PATENT OFFICE.

GEORGE B. LAMB, OF WATERBURY, CONNECTICUT, ASSIGNOR TO THE WATERBURY FARREL FOUNDRY AND MACHINE COMPANY, OF SAME PLACE.

HYDRAULIC-PRESSURE VALVE.

SPECIFICATION forming part of Letters Patent No. 543,772, dated July 30, 1895.

Application filed December 3, 1894. Serial No. 530,641. (No model.)

To all whom it may concern:

Be it known that I, GEORGE B. LAMB, a citizen of the United States, residing at Waterbury, in the county of New Haven and State of Connecticut, have invented an Improvement in Hydraulic-Pressure Valves, fully described and represented in the following specification and accompanying drawings, forming a part of the same.

A valve designed to automatically release the pressure at a certain point is generally used in connection with hydraulic presses, both as a safety device and also, which is of particular importance in certain classes of work, to insure a continued repetition of exactly the same pressure at each stroke. Such valves in general depend for their action on the equilibrium of two forces in contrary directions, one a weight or the tension of a spring, tending to hold the valve against its seat, and the other the pressure of the water, tending to raise it. When these opposing forces balance each other, the valve is ready to lift and any slight increment of pressure should raise it. Under moderate pressures such a valve behaves well enough, but under great pressures there seems to be a neutral or uncertain zone of considerable range through which such a valve may act, thus diminishing its reliability and destroying its accuracy. Efforts to positively hold the valve in place by means of a catch are also unsuccessful, as at great pressures the effect is almost the same as if a weight or spring were used, owing to the slight extension or compression of the parts.

The object of my invention is to obviate certain serious and heretofore almost unsurmountable difficulties encountered in dealing with the release and control of water under very great pressures, as five or ten thousand pounds to the square inch—namely, the oozing of water through the release-valve, with the consequent loss of pressure and the varying and uncertain action of the valve. Such enormous pressures, practice seems to indicate, can only be controlled successfully by means of valves which become more and more firmly seated as the pressure increases, on the principle of the well-known check-valve, and my invention has to do with a mechanism for lifting or opening such a valve at the proper time, however great the pressure may be, and, although it is general in its application for the purpose specified, it is particularly adapted as an improvement to the hydraulic-pressure-release valve, for which I received the grant of a patent, No. 490,290, dated January 24, 1893.

Referring to the drawings, Figure 1 is a side elevation of a hydraulic-pressure-release valve of a slightly different design but mechanically equivalent to the one illustrated in my Patent No. 490,290, with the exception of the valve 2 and stem 5, which embody my present improvement as contemplated and practiced in its application to that valve. Fig. 2 is a side elevation of a valve designed to illustrate the principle of my present improvement.

Similar characters refer to similar parts in both drawings.

In Fig. 2 is represented a valve-chamber of any convenient form filled with water subject to pressure. At either side are shown gateways for connecting the necessary pipes to pump and press. A check-valve 2 is seated over an orifice leading to an exhaust or waste pipe. A stem 5, which enters the chamber through a proper stuffing-box, is loosely joined at its inner end to the check-valve 2 by means of the head and shoulder of the swivel-joint shown. The area of a cross-section of stem 5 is slightly larger than the seat of valve 2. Consequently the pressure forcing stem 5 outward is greater than the pressure holding valve 2 against its seat by an amount due to the difference of areas referred to, and the valve 2 will be lifted from its seat by the stem 5 as soon as the head and shoulder of the swivel-joint abut. It now only remains to fasten the stem 5 by any convenient means, so that it may be automatically or otherwise released at the proper pressure. I have illustrated a simple means of accomplishing this, to which I will return later, though any one of a hundred well-known contrivances would perhaps do as well.

The particular advantage of the above arrangement of the valve and stem lies in the

fact that the valve 2 is essentially a check-valve and becomes more and more firmly seated as the pressure increases; and any slight motion of the stem 5 does not affect the valve 2, owing to the loose swivel-joint. Moreover, when the stem 5 is released it is bound to lift the valve, no matter how great the pressure, so that there is no necessity of relying on springs or weights, which at best are but uncertain.

In regard to the mechanism referred to for fastening and releasing stem 5, it will be seen that the upper end of the stem is pivoted to a lever handle, which engages the catch 4, and that the piston 3, which enters the valve-chamber under the pressure of a spring, abuts at its outer end against the catch, whereby the same is tripped when sufficient pressure is developed to overcome the spring. Thus, the stem 5 once fastened by the catch is firmly held until released, when it immediately responds to the hydraulic pressure within the chamber and lifts the valve 2 from off its seat, thereby permitting the water to escape to the waste-pipe.

I have represented the catch 4, in Fig. 2, as hinged to a weighted lever, as in my Patent No. 490,290. It acts merely as a safety device to prevent accident if for any reason the piston 3 should refuse to operate. In Fig. 1 it is represented as hinged directly to the body of the casting, and in this case is figured to break under the tensional strain when the limiting hydraulic pressure is reached.

It is essential for the smooth working of the valve, and to prevent pounding, that there should be as little play as is consistent between the head and shoulder of the swivel-joint referred to.

Following is the order of procedure in the operation of the valve shown in Fig. 1, which, as before stated, is a combination of my Patent No. 490,290 and my present improvement: The spring about the piston 3 is adjusted by a hand-nut to yield at a certain pressure and the hand-lever set, as shown, to engage catch 4, thereby seating both valve 1 and valve 2. A spring 6 under compression has its lower end resting on the casting and its upper end abutting against a shoulder around stem 5, (Figs. 3 and 4 are a plan and front elevation of the upper end of stem 5, showing details of construction,) thereby tending to raise the stem. As pressure is developed in the chamber C, these valves, being check-valves, become more and more firmly seated. At the required pressure the piston 3 moves upward, overcoming the resistance of its spring, and trips the catch 4. The stem 5 being thus released, operates under the hydraulic pressure in the chamber C and lifts the check-valve 2 until stopped by the projection on the large valve 1. The pressure is thus allowed to drop slowly, owing to the very small opening under valve 2. At length a point is reached at which the spring 6, around stem 5, overcomes the remaining pressure on the large valve 1 and lifts it clear of its seat, thus permitting a free escape of water preparatory to another stroke.

Small drill-holes are shown leading to different parts of both valves and valve-chamber to insure a free circulation of water.

I claim—

1. In a hydraulic-pressure valve, the combination of a valve chamber; a check-valve, for preventing the escape of fluid under pressure; a piston stem or rod, loosely joined thereto near one end within the chamber, the other end being subject to atmospheric pressure: said rod having a degree of freedom in the necessary direction, sufficient for opening said valve, and having an area exposed to fluid pressure in that direction, greater than the exposed area of the valve to opposing pressure whereby there is a resultant force tending to open said valve, and a catch and tripping piston substantially as described, for retaining the valve rod in position until released by the pressure of the fluid.

2. In a hydraulic pressure release valve, the combination of a valve 1 having a chamber C, a check-valve 2; a piston stem or rod 5, loosely joined thereto near one end, the other end being subject to atmospheric pressure; arranged substantially as described, for opening and closing valve 2, and having its cross sectional area greater than that of the valve 2; and a fastening device, consisting of a catch and tripping piston, substantially as described, for holding and releasing rod 5; combined to operate in the manner described and for the purpose specified.

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