F. W. CLARKE.

Force-Pump.

No. 167,433. Patented Sept. 7, 1875.

Fig. 1.

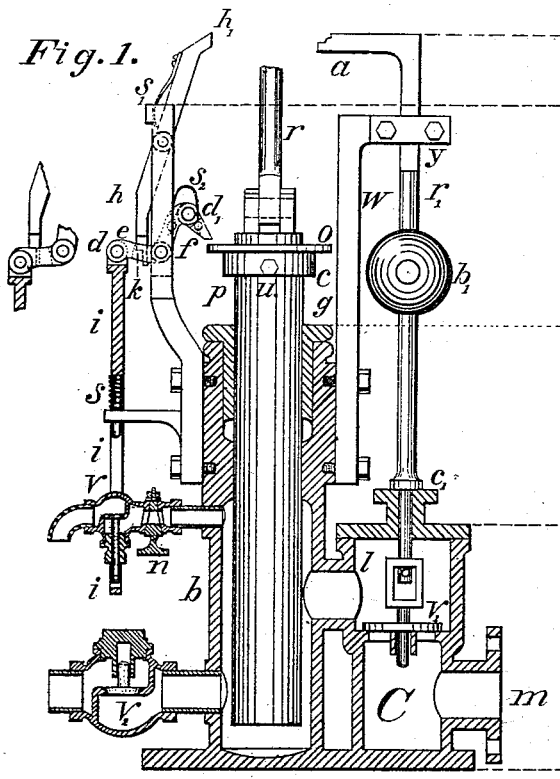


Fig. 2.

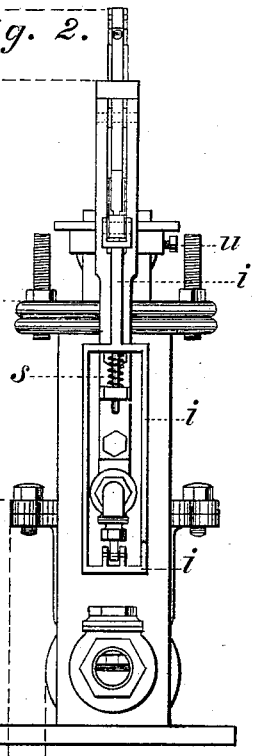
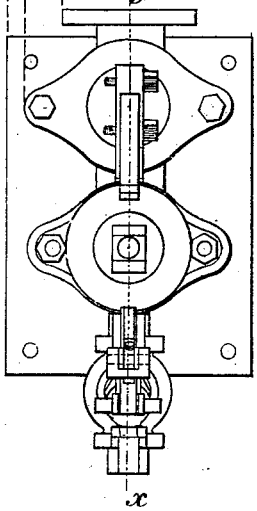


Fig. 3.



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UNITED STATES PATENT OFFICE.

FREDERICK W. CLARKE, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN FORCE-PUMPS.

Specification forming part of Letters Patent No. **167,433**, dated September 7, 1875; application filed June 5, 1875.

To all whom it may concern:

Be it known that I, FREDK. W. CLARKE, of the city and county of San Francisco, State of California, have invented a certain new and useful Improvement in Force-Pumps; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings and to the letters of reference marked thereon, which form a part of this specification.

The object of my invention is to produce a force-pump which will pump with facility water whose temperature is 212° Fahrenheit.

In order to enable those skilled in the art of using or manufacturing that class of machinery to which my invention appertains to clearly comprehend my invention, I will now proceed to describe its construction and operation, reference being had to the accompanying drawings.

Figure 3 is the plan of a feed-pump for boilers, which embodies my invention. Fig. 2 is an elevation of same. Fig. 1 is a sectional elevation of same, with the exception of the piston or plunger p, with its adjuncts, the valves v, v_1, and v_2, the mechanism by means of which the valve v_1 is operated, and a part of that by means of which the valve v is worked, which parts, in order to render the drawing more perspicuous, are drawn in full. The section represented is that which lies on the left of the line $x\ x$ on the plan.

Since Fig. 1 exhibits more clearly all those parts of the machine which it is necessary to describe, reference will be had to that figure unless otherwise mentioned.

b is the body of the pump; v_1, the induction-valve, which is operated by means of the mechanism $a\ w\ y\ r_1\ b_1$, &c., in the manner hereinafter explained; v_2, the check-valve; g, the gland of the stuffing-box; p, the piston; r, the driving-rod, by means of which the pump is connected with the operative mechanism; and c a flanged collar, which is fixed firmly to the piston by means of the set-bolt u. v is a valve, opening downward, and operated by means of the mechanism $h_1\ h\ d_1\ d\ i\ i$, &c., which opens and closes it at the proper intervals, in the manner hereinafter described. n is a stop-cock, which is used in connection with the valve v. The piston is represented in the figure as being at its lowest point. It is at its highest point when the face of the flange o of the collar c is in the same horizontal plane with the highest point h_1 of the spring-latch $h\ h_1$.

The manner in which the valves v and v_1 are operated is as follows: As the piston ascends the flange o of the collar c presses upward against the spring-finger f. This causes the end d of the lever $d_1\ d$ to recede from the piston until, finally, as the latter continues to ascend, the spring-finger becomes disengaged from the flange. In the meantime the end d of the lever is depressed, carrying with it the connecting-rod or connecting-link i, (shown more fully in Fig. 2,) compressing the spring s and opening the valve v. As the upper edge or back e of the lever $d\ d_1$, in its downward movement, passes by the shoulder k, which is at the lower extremity of the latch $h\ h_1$, this shoulder is, by the reaction of the spring s_1 upon the upper portion of the latch $h\ h_1$, forced outward and over the back of the lever into the position represented by the detail drawing on the left of the figure. It is evident that the lever $d\ d_1$ cannot return to the position which it occupies in Fig. 1 so long as the latch $h\ h_1$ remains in the position in which it is represented to be in the detail drawing, and, consequently, the valve v does not close as the flange o, on the continued ascent of the piston, becomes disengaged, as aforesaid, from the spring-finger f. As, however, the piston is almost at its maximum height the flange o comes in contact with the short arm h_1 of the spring-latch, pressing it outward, disengaging the shoulder k from the lever $d\ d_1$, and thus permitting the spring s to close the valve v. Also, as the piston ascends, and is within a short distance of the end of the stroke, the collar o comes in contact with, and presses upward against, the arm a, lifting thereby the rod r_1 and opening the valve v_1. As the piston descends, after having completed the upstroke, the rod r_1 is, by the force of its own weight, lowered to the position which it is represented as occupying in the figure, thus allowing the valve v_1 to close, which it will do by the force of gravity. As the piston in its descent approaches near to its minimum height the collar o again comes in contact with the

finger *f*, pressing it downward and outward toward the fulcrum of the lever $d\,d_1$. As soon as the flange *o* disengages from the finger by passing below it the latter is returned by the reaction of the spring s_2 to its original position, shown in the figure. As the piston again ascends and descends the several motions just described are repeated, and so on indefinitely.

In order to pump hot water with this pump it is necessary that the head of the water be at least a few inches higher than the top of the body of the pump. If, then, the pipe which conducts this water to the pump be connected with the induction-pipe *m* of the latter the water will, by the force of gravity, discharge into the chamber *c*, and, if the head of the water is sufficiently great, raise the valve v_1 from its seat, (which, as will be seen by inspection of the figure, can be done without moving the mechanism $a\,r_1\,b_1$, &c.,) and enter into the interior of the pump. As this interior at the outset contains air, enough water cannot enter to entirely fill the same; but as the piston ascends, and the valve *v* is opened, the inclosed air escapes, and the water rushes in, entirely fills the interior, and the space occupied by the piston is replaced by the water as fast as the former is withdrawn. If, during the ascending stroke of the piston, the valve v_1, in consequence of its weight, rests so firmly upon its seat, or if, in consequence of the valve becoming gummed, or of some other mechanical cause, it adheres so firmly to its seat that the pressure of the supply-water fail to open it, no water will enter the pump until near the termination of the stroke, when the valve will then be opened by the raising of the rod r_1, and the water will then rush into and fill the interior of the pump, the air contained therein escaping through the valve *v*, which is not closed until the last moment of the upstroke. On the descending stroke, the valve *v* being closed, no water can escape in that direction, but some will be forced back through the valve v_1 until that point of the stroke is reached which allows of the closing of that valve, in the manner hereinbefore described, after which the remainder of the water contained in the pump will be forced through the check-valve v_2 into the boiler. At the succeeding ascent and descent of the piston the operation just described is repeated, and so on indefinitely.

If, during the operation of the pump, the stop-cock *n* is left wide open, it will be found that considerable water will escape through the valve *v* during the upstroke of the piston. To prevent this the stop-cock is carefully turned until it is observed that only a few drops of water escape through it, near the termination of the ascending stroke.

The object of the ball b_1 is to add to the weight of the rod r_1, thus insuring its descent, which is opposed by the friction at the bearing *y* and at the stuffing-box c_1. The same object could be effected by means of a spring properly positioned.

Should it be considered advisable to have the valve v_1 forced open at the beginning of the upstroke, as is done in the case of the valve *v*, the mechanism by which it is operated might be constructed similar to that which operates the latter valve, and, indeed, a single movement, similar to that of the valve *v*, might be made to operate both valves simultaneously. It is also evident that either of the valves *v* or v_1 can be operated by means of movements different from either of those herein described. I do not therefore confine myself to the exact operating mechanism shown and described.

The difficulty heretofore experienced in pumping boiling-hot water with the ordinary force-pump is due to two causes; first, the forming of vapor within the pump, which arises from the hot water left therein after the descending stroke has been completed, and which, since there is no means provided for its escape, retards or prevents the farther influx of the supply-water; and, second, the adhesion of the valve to its seat, in consequence of either the valve or the seat, or both of them, becoming gummed, and sometimes in consequence of the valve (where it is made conical in shape) being wedged into its seat by the great pressure of the water which is exerted upon it during the downstroke.

These two difficulties are overcome by my invention by the operation of the valve *v*, which permits the escape of any vapor formed within the pump, and by the mechanism or movement $a\,r_1\,b_1$, &c., by means of which the induction-valve is, at every stroke, forced open for at least a sufficient length of time to permit the supply-water to enter and fill the pump.

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

1. In a force-pump for pumping hot water, an escape-valve, *v*, actuated by mechanism substantially as described, and for the purposes herein set forth.

2. In a pump for pumping hot water, the induction-valve v_1, operated by either of the mechanisms shown and described, actuated by the piston or by any of the operative mechanism which drives the piston, in the manner substantially as described and for the purposes herein set forth.

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