W. LYMAN.

Automatic-Pump.

No. 217,626. Patented July 15, 1879.

fig. 1

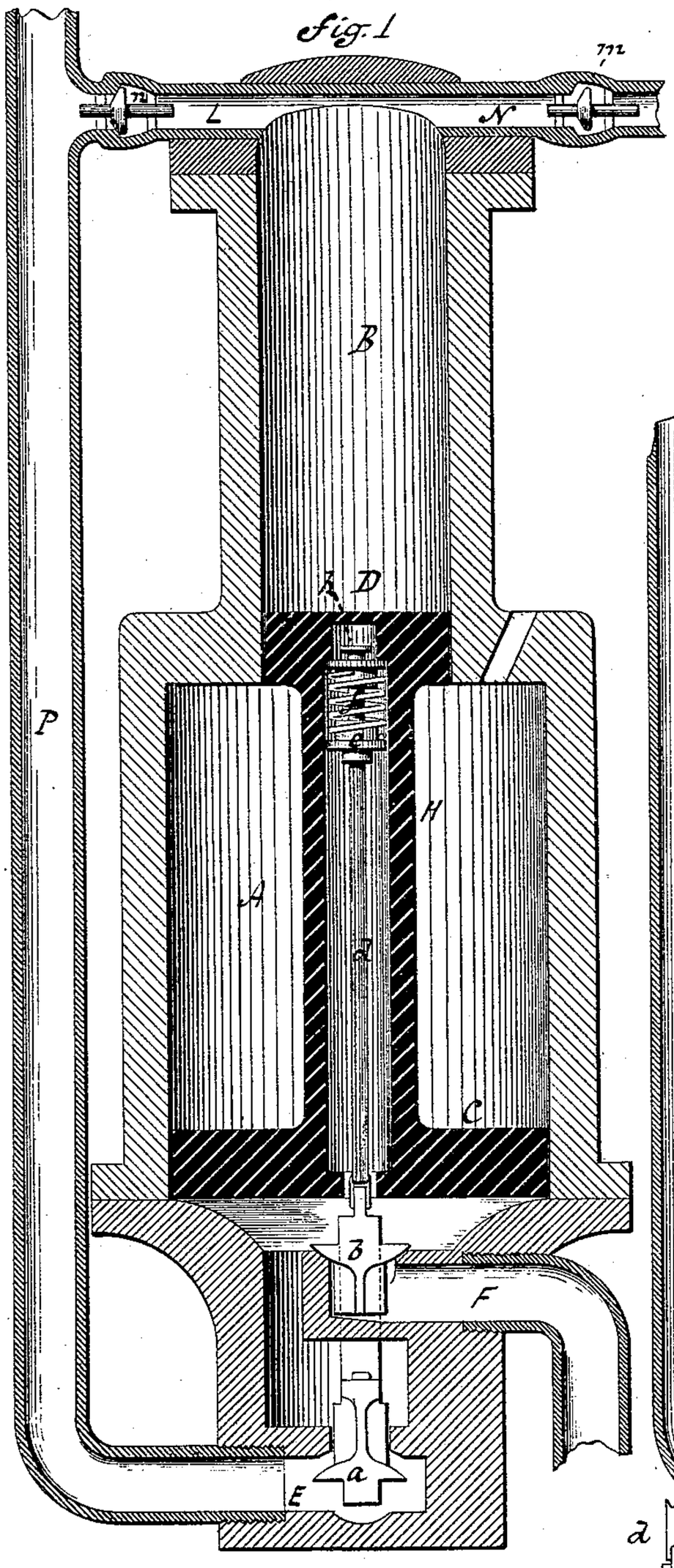


fig. 2.

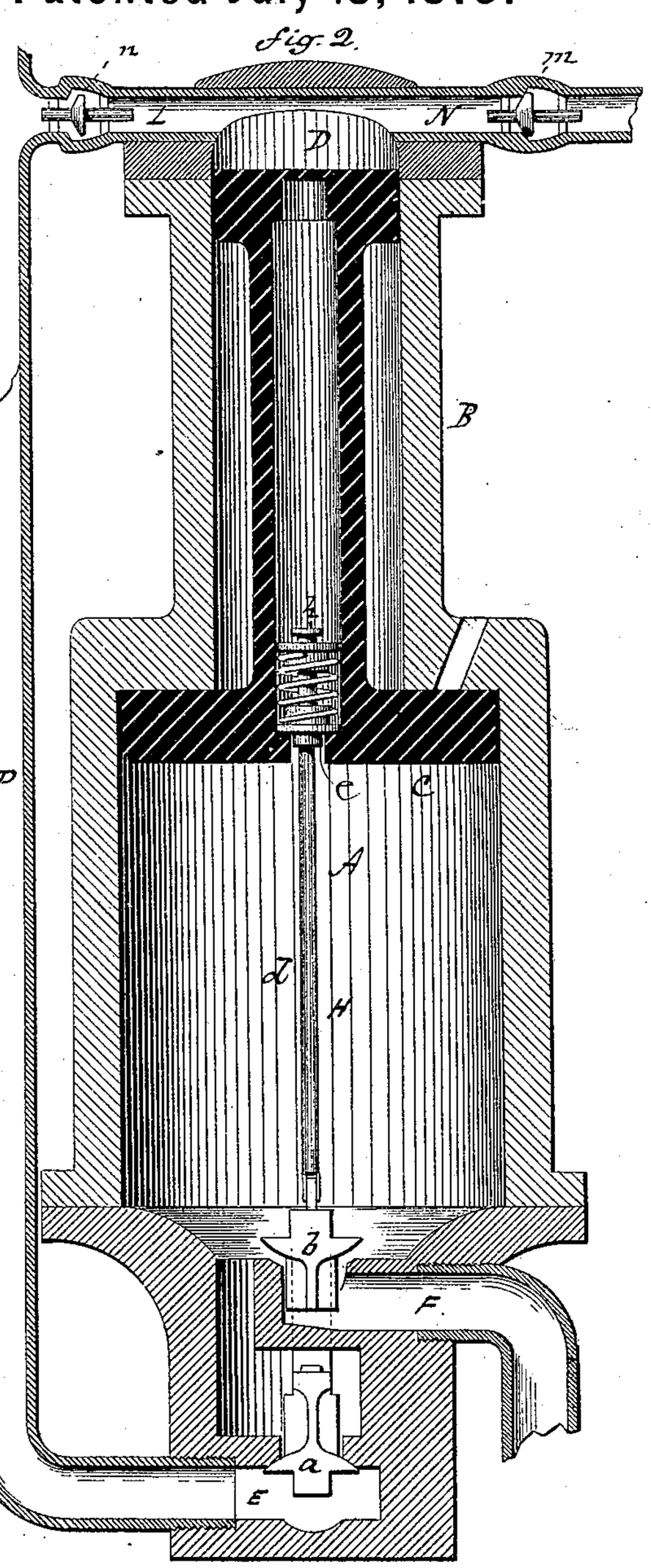
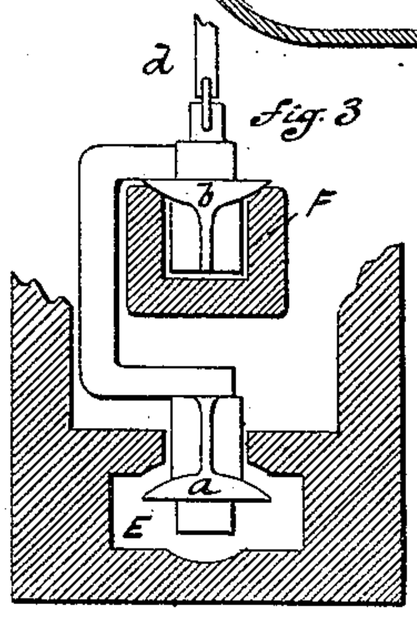


fig. 3



Witnesses.

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UNITED STATES PATENT OFFICE.

WILLIAM LYMAN, OF MIDDLEFIELD, CONNECTICUT.

IMPROVEMENT IN AUTOMATIC PUMPS.

Specification forming part of Letters Patent No. **217,626,** dated July 15, 1879; application filed May 12, 1879.

To all whom it may concern:

Be it known that I, WM. LYMAN, of Middlefield, in the county of Middlesex and State of Connecticut, have invented a new Improvement in Automatic Pumps; and I do hereby declare the following, when taken in connection with the accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figures 1 and 2, vertical central sections, showing the piston in the two extreme positions of its movement; and in Fig. 3, vertical cross-section through the lower valve and seats.

This invention relates to an improvement in that class of pumps or water-forcing devices in which, by the employment of a certain quantity of water at a given fall, a smaller quantity is raised to a higher level; and it consists in a pair of differential cylinders and pistons, combined with the valve arrangement, for receiving and delivering the force, as hereinafter described, and particularly recited in the claims.

A is the power-cylinder, and B the pump or force cylinders, less in diameter than the cylinder A, according to the work to be done. These cylinders are arranged in axial line, opening one into the other, as shown. In the cylinder A is a solid piston, C, that is so that no water is permitted to pass through or above it, and in the cylinder B is a solid piston, D, that is so that no water is permitted to pass below or through it, the two connected and fitted so as to move freely, yet tightly, in their respective cylinders, and so that no flow of water can enter between them, but to always maintain the same relative position to each other, they being shown as down, or at one extreme of their movement, in Fig. 1, and up, or at the other extreme, in Fig. 2.

At the lower end of the cylinder A, or the end opposite the other cylinder, is a valve, *a*, in the inlet-passage E, and a second valve, *b*, in the outlet-passage F, each being constructed to fit its own seat, but the two connected as in Fig. 3, or otherwise, so that as one closes the other opens. These valves are attached to a valve-rod, *d*, extending up into the tubular connection H of the pistons.

On the spindle *d* is a loose collar, *e*, near the upper end, and on which is a spring, *f*, with a loose collar, *h*, above. The upper end of the hollow connection H is closed, and at the bottom it is partially closed, and so as to form a shoulder at both top and bottom to strike, respectively, the collars *h* and *e*.

Into the upper or smaller cylinder is an inlet, L, from the supply, and in which is a valve, *n*, opening inward, and from this cylinder an outlet, N, provided with a valve, *m*, opening outward.

The supply-pipe P may communicate with the inlet-passage to both the larger and smaller cylinder, as shown.

Arrows denote the direction of the water in the operation of the pump, which is as follows: Supposing the pistons to stand in the position seen in Fig. 1, the smaller cylinder filled from the supply-pipe—say under a pressure of ten feet—this supply flows into the larger cylinder through the open valve *a* and below the piston C, and exerts its force upon the piston; and because it is larger than the other piston, D, the excess of force causes it to rise, and with it the smaller piston. This rising of the smaller piston closes the inlet-valve *n* and opens the outlet-valve *m*. This cylinder being smaller—say, for instance, one-fourth the area of the larger—the full force of the larger is exerted upon the smaller, or as 4 to 1, minus friction, and the water in the smaller cylinder will be proportionately raised to a higher level—forty feet. As the pistons approach their extreme upward movement, the shoulders below strike the collar *e* on the spindle and raise the two valves *a* and *b*, as seen in Fig. 2, which closes the inlet and opens the outlet F; then the inlet-valve *n* above will be opened and the outlet-valve *m* closed, the latter by the reaction of the water which has been forced through it, and the force of the inflowing water will drive the piston downward, the water which raised them passing out at F to waste or otherwise. As the pistons approach their extreme downward movement, the shoulder above strikes the collar *h* and forces the valves down into their first position, as seen in Fig. 1. This operation now leaves the smaller cylinder full for the return stroke of the pistons, and, so continuing, the pis-

tons are forced up and down, producing an intermittent stream through the outlet from the smaller cylinder.

The spring *f* between the collars *e* and *h* allows the full force of the moving pistons to be applied before the valves start, and when they so start, then the reaction of the spring causes a quick or sudden movement of the valves, making their movement instantaneous.

This apparatus may be made double-acting by making a closed division between the two cylinders and applying a double-valve arrangement.

To provide for the escape of water which may accidentally work its way into the space between the two pistons, an opening is made at the top of the larger cylinder, through which the leakage will freely pass as the piston rises.

I do not broadly claim a pump consisting of differential cylinders and pistons, the larger to act as the power and the smaller as the pump, so that by the use of a larger quantity of water under a certain fall a smaller quantity may be raised to a higher level, as such I am aware is not new; but

What I do claim, and desire to secure by Letters Patent, is—

1. The combination of the differential cylinders A B and their respective solid pistons C and D, connected together by a tubular connection with an inlet and outlet valve *a* and *b* for the large cylinder, connected together and to a spindle, *d*, within the tubular connection of the pistons and collars on said spindle, whereby said valves are simultaneously operated at the two extremes of movement of said pistons, and outlet and inlet valves *m* and *p* for the smaller cylinder and above its piston, substantially as described.

2. The combination of the differential cylinders A B and their respective solid pistons C and D, connected together by a tubular connection, with an inlet and outlet valve, *a* and *b*, for the large cylinder, connected together and to a spindle, *d*, within the tubular connection of the pistons, and collars on said spindle, with a spring between said collars, whereby said valves are operated by said pistons through said springs, and outlet and inlet valves *m* and *p* for the smaller cylinder and above its piston, substantially as described.

WILLIAM LYMAN.

Witnesses:

LYMAN A. MILLS,

WM. R. RICHARDSON.