No. 861,580. PATENTED JULY 30, 1907.

L. W. EGGLESTON.

HYDROPNEUMATIC ENGINE.

APPLICATION FILED MAR. 25, 1907.

Fig. 1.

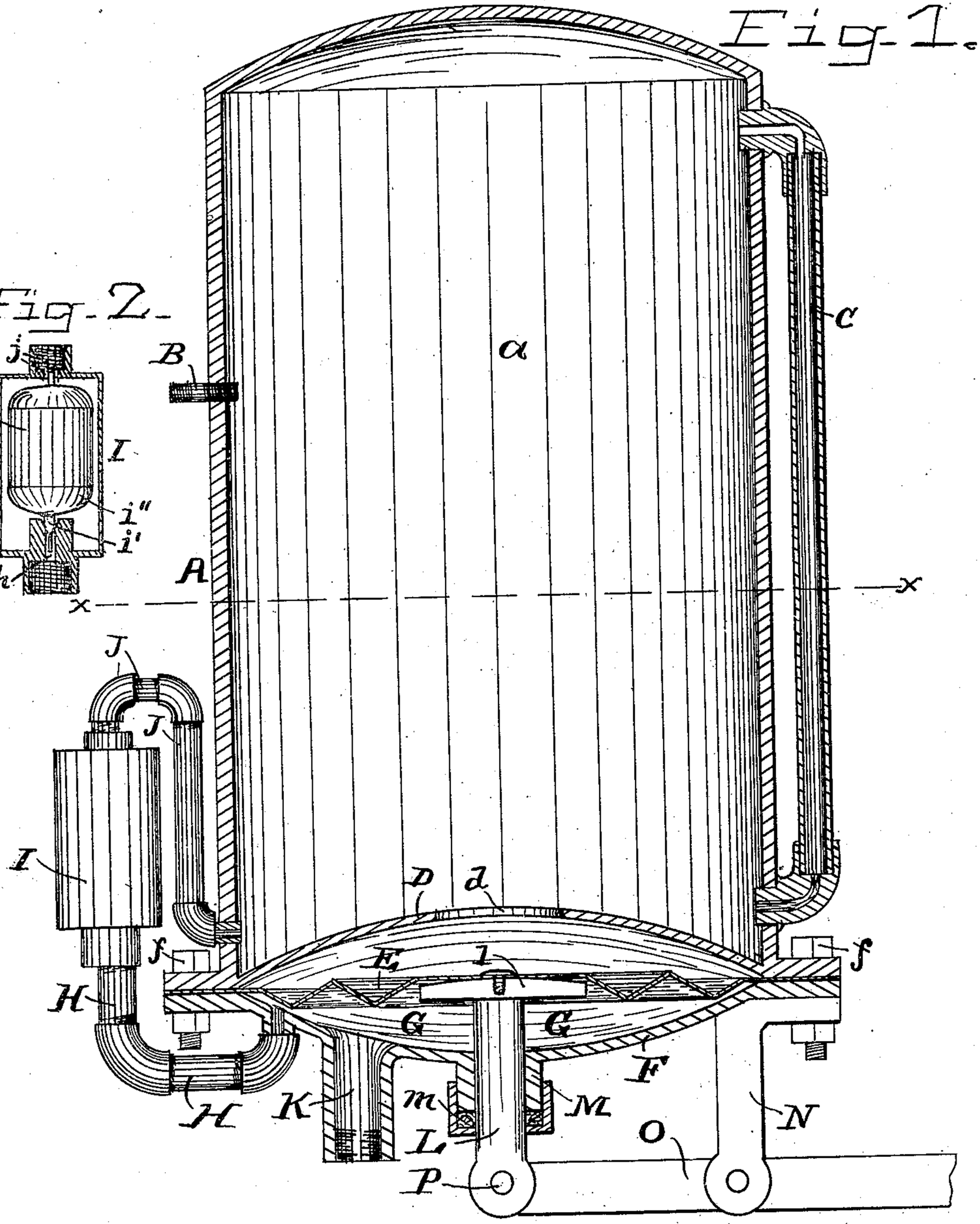

Fig. 2.

Witnesses:
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UNITED STATES PATENT OFFICE.

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HYDROPNEUMATIC ENGINE.

No. 861,580. Specification of Letters Patent. Patented July 30, 1907.

Application filed March 25, 1907. Serial No. 364,426.

To all whom it may concern:

Be it known that I, LEWIS WATSON EGGLESTON, a citizen of the United States, and a resident of Appleton, in the county of Outagamie and State of Wisconsin, have invented certain new and useful Improvements in Hydropneumatic Engines, of which the following, when taken in connection with the drawing accompanying and forming a part hereof, is a full and complete specification, sufficient to enable those skilled in the art to which it pertains to understand, make, and use the same.

The object of this invention is to obtain a hydropneumatic engine suitable to be attached to a water main and to be actuated by the varying pressures in such water main.

A further object of the invention is to obtain a hydropneumatic engine which will be automatic in its adjustment to a variation of pressure lasting for any considerable time in the water mains to which the engine is attached, while at the same time the engine will be operated by the continuous variation of pressure occurring in such water main.

I have illustrated a hydro-pneumatic engine embodying this invention in the drawing herein before referred to in which

Figure 1 is a vertical sectional view of such engine, and Fig. 2 is a vertical sectional view of a floating check, showing the interior construction thereof.

A reference letter applied to designate a given part is used to indicate such part throughout the several figures of the drawing, wherever the same appears.

A is a cylinder.

a is a chamber in cylinder A.

B is an ordinary air check valve, such as is used in pneumatic tires, through which air may be forced into the cylinder A by means of an ordianry air pump.

C is a glass gage by means of which the height of water in cylinder A may be observed, as say, when the water in such cylinder is to about the level of the line X—X.

D is one end of cylinder A and is provided with hole *d* therethrough.

E is a diaphragm and F is an additional end to cylinder A, by means of which a chamber G is obtained between such end and the diaphragm E.

f, *f*, are the bolts by which end F is secured in place to the flange of cylinder A.

H is a pipe communicating with chamber G and with floating check I and J is a pipe communicating with such floating check I and with the chamber in cylinder A. Floating check I consists of a shell provided with a float chamber *i*, an inlet *h* and an outlet *j*, and a valve *i'* mounted on float *i''*. When float *i''* is raised by water in float chamber *i* water may flow in either direction through the floating check.

K is a passage way communicating with chamber G.

L is a piston longitudinally movable in the neck M of bottom F and provided with the head *l* in contact with the diaphragm E. The neck M is provided with a stuffing box *m*.

N is a standard and O is a lever fulcrumed in standard N and attached to the longitudinally movable piston L by means of pivot P.

Work is obtained from this engine because of the movement of lever O by connecting such lever O to the machine or thing to be actuated thereby. To put the engine in operative condition the passage way K is attached to a water main, and water is admitted into chamber G and allowed to flow therefrom through pipe H, floating check I and pipe J into chamber *a;* and air is forced into the chamber *a* through check valve *b* until what is believed to be the average pressure in the water mains to which the engine is attached, is obtained in chamber *a* with the water line in such chamber not above the line X—X.

The operation of the engine is—variations in pressure in the water main to which the engine is attached produces a corresponding variation of pressure in the chamber G, and such variation will occur so quickly that a corresponding movement of the diaphragm E and piston L and lever O will be obtained. If variation of pressure in chamber G be continued for any considerable time whether such variation be above or below the pressure in the chamber *a*, water will flow through pipe H, floating check I and pipe J from the chamber of higher pressure to the one of lower pressure until the pressure is equalized. The flow through such pipes H, and K and floating check I is slower than would be required to maintain the pressure in the two chambers alike under the constantly varying pressure in chamber G and hence the diaphragm E is in constant movement to obtain equal pressure in chamber *a* and G and it is the constant movement of diaphragm E which is utilized, through the corresponding movement of the piston L and lever O, in the operation of the engine. The supply of air in the chamber *a* is maintained constant after a sufficient quantity of air is forced thereinto to obtain the required pressure as hereinbefore set out and hence where the valve in chamber *a* and valve B are air tight no additional air is required therein but in case of a small leakage of air from such chamber *a* the loss of air is replenished through check valve B as herein before described.

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

1. In a hydro-pneumatic engine, a chamber provided with a passage way communicating therewith to permit water to flow thereinto and therefrom, a movable wall to the chamber, means to yieldingly hold the movable wall in a given position with a determined initial pressure in the chamber and to return such movable wall to its initial

position at each recurrence of initial pressure, means to automatically maintain the yielding pressure on the movable wall at substantially the average pressure of the water actuating the diaphragm, and a longitudinally movable piston arranged to contact with the movable wall and to be actuated by movement of the movable wall; substantially as described.

2. In a hydro-pneumatic engine, a plurality of chambers, a movable wall common to both chambers, one of such chambers provided with a passage way communicating therewith to permit water to flow thereinto and therefrom, and the other one of such chambers arranged to hold fluid under pressure to yieldingly maintain the movable wall in a given position with a determined initial pressure in the chamber provided with a passage way thereinto, and to return such movable wall to its initial position at each recurrence of initial pressure and a longitudinally movable piston arranged to contact with the movable wall and to be actuated by movement of the movable wall; substantially as described.

3. In a hydro-pneumatic engine, a plurality of chambers, a movable wall common to both chambers, one of such chambers provided with a passage way communicating therewith to permit water to flow thereinto and therefrom, and the other one of such chambers arranged to hold fluid under pressure, a passage way connecting the chambers, such passage way constructed and arranged to permit a slow equalization of pressure between the chambers, and a longitudinally movable piston arranged to contact with the movable wall and to be actuated by movement of such movable wall; substantially as described.

4. In a hydro-pneumatic engine, the combination of a plurality of chambers and a movable wall common to both chambers with a pipe communicating with both chambers and a floating check valve interposed in such connecting pipe, one of such chambers provided with a passage way communicating therewith to permit water to flow thereinto and therefrom, and the other one of such chambers arranged to hold fluid under pressure to maintain the movable wall in a given initial position when the pressure in the chambers is equal and to return such movable wall to its initial position at each recurrence of equal pressure in the chambers, and a movable piston arranged to contact with the movable wall and to be actuated by movement of the movable wall; substantially as described.

5. In a hydro-pneumatic engine, a chamber provided with a passage way communicating therewith to permit fluid to flow thereinto and therefrom, a movable wall to the chamber, means to yieldingly hold the movable wall in a given position with a determined initial pressure in the chamber and to return such movable wall to its initial position at each recurrence of initial pressure, and means to vary the pressure of the yieldingly holding mechanism to the movable wall to automatically equalize within a determined time the pressure on both sides of the movable wall, and a longitudinally movable piston arranged to contact with the movable wall and to be actuated by movement of the movable wall; substantially as described.

LEWIS WATSON EGGLESTON.

In the presence of—
CHARLES TURNER BROWN,
CORA A. ADAMS.