(No Model.)

C. E. FOSTER.

HYDRAULIC ENGINE.

No. 357,147. Patented Feb. 1, 1887.

Fig. 1.

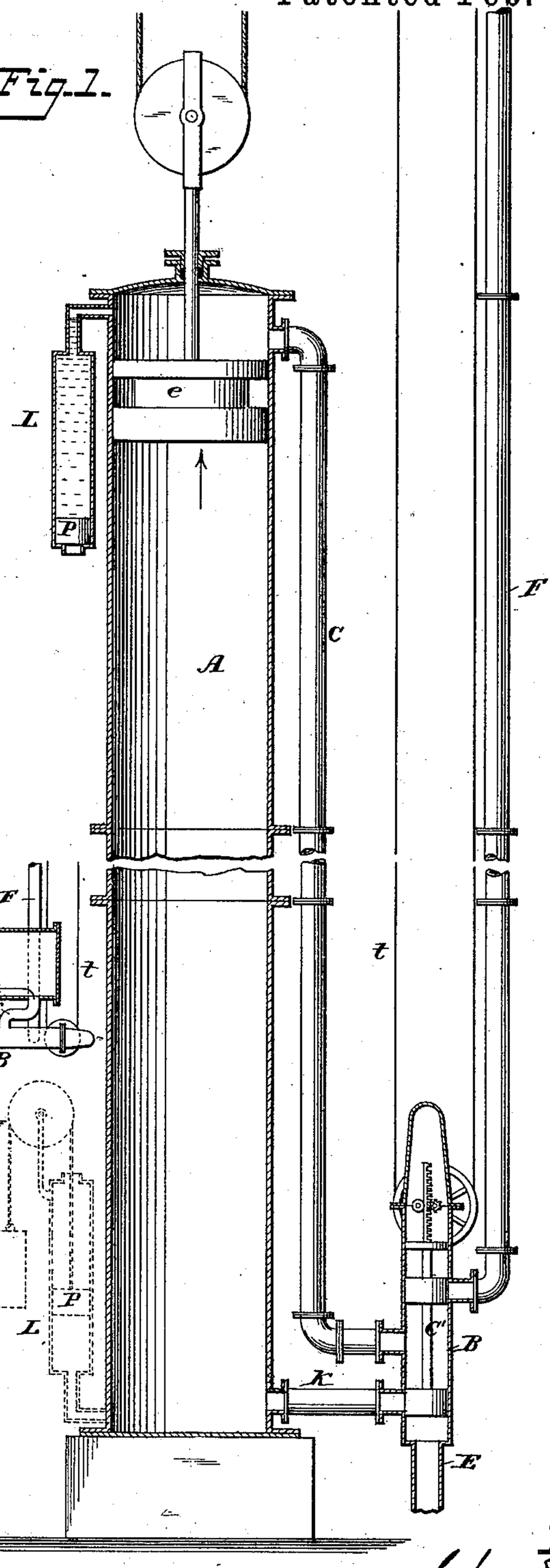
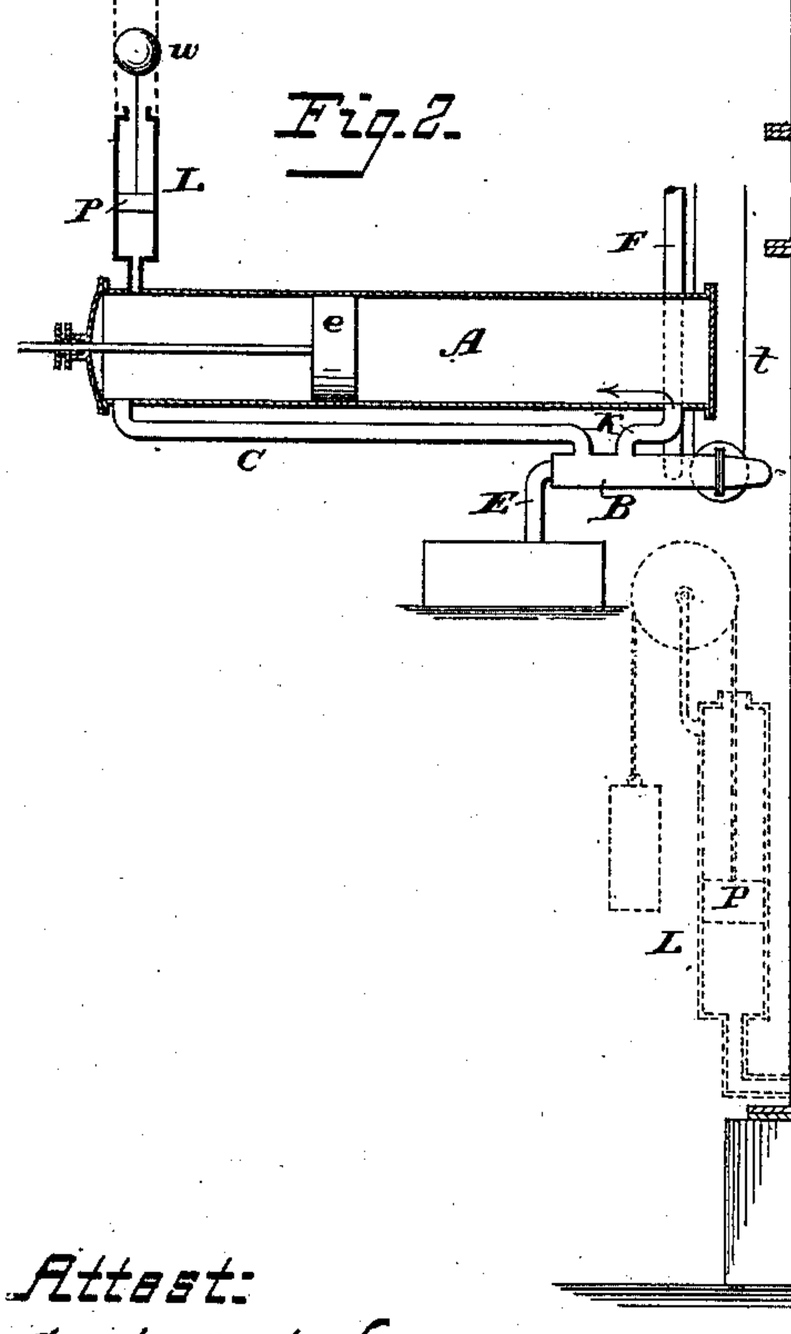


Fig. 2.



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UNITED STATES PATENT OFFICE.

CHARLES E. FOSTER, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO THE HYDRAULIC ELEVATOR COMPANY, OF CHICAGO, ILLINOIS.

HYDRAULIC ENGINE.

SPECIFICATION forming part of Letters Patent No. 357,147, dated February 1, 1887.

Application filed January 7, 1884. Serial No. 116,673. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. FOSTER, a citizen of the United States, and a resident of the city of Washington, in the District of Columbia, have invented certain new and useful Improvements in Hydraulic Engines, of which the following is a specification.

My invention relates to that class of water-engines usually employed for elevators, in which the piston is propelled to lift the cage by water under pressure and the cylinder during circulation is cut off from the supply; and my invention consists of means whereby to permit a circulation of the water from one end of the piston to the other without necessarily maintaining connection with the supply-pipe.

In the drawings, Figure 1 shows, in sectional elevation, a vertical-cylinder elevator embodying my invention; and Fig. 2 is a section showing the application of the invention to a horizontal-cylinder elevator.

A is the usual cylinder, vertical or horizontal, containing the piston *e*, the movement of which moves or raises and lowers the cage, or other thing to which it is connected, in any suitable manner.

F is the water-inlet tube, which is supplied with water or other incompressible fluid from a tank, pressure-reservoir, or street-main.

C K are pipes leading to the opposite ends of the cylinder from a valve-chest, B, containing a valve, C′, of any suitable character, and communicating with the tube F.

From the chest extends a discharge-pipe, E. The valve and ports, Fig. 1, are so arranged that water may flow from the pipe F, through the chest B, to the pipe C, and to the cylinder on the outer or piston-rod side of the piston, to move the piston in one direction, while the water from the inner or discharge side of the piston flows through the pipe K to the discharge.

On depressing the valve the pipes C K will be put in communication and the water will flow from the outer to the inner end of the cylinder as the piston rises under the weight of the load. By bringing the valve to close the port communicating with the pipe F movement is absolutely prevented.

Any other valve arrangements which will effect these operations may be adopted, the particular style of valve forming no part of my invention.

Inasmuch as the piston-rod decreases the water-space above the piston, it is not possible for the piston to ascend when communication with the pipe F is closed without creating a vacuum under the piston, as the water from above will not fill the space below the piston. I therefore provide a tank or reservoir, L, communicating freely with one end of the cylinder, or with the water-circulation at any point, the water in said reservoir flowing into the main cylinder, when the piston *e* ascends, to make up the addition required, and the pressure of the water from the supply on the descent of the piston filling the reservoir and constituting a store for use when the piston again descends.

To prevent the escape of water from the reservoir or tank L, arranged as shown, a sliding piston or valve, P, is used, said piston rising when the water from the reservoir is given off to the cylinder and descending when there is no longer any pressure within the cylinder.

The supply and receiving tank may communicate either with the outer end or top of the cylinder, as shown in full lines, Fig. 1, or with the inner end or bottom, as in dotted lines. In the former case the tank L is inverted, so that the loose piston P will descend, under the pressure of the water, when the piston *e* is forced downward. When the reservoir connects with the lower end of the cylinder, it may be arranged in like manner, or it may be reversed, as shown in dotted lines, and the piston P may be connected to a counter-weight, which tends to keep it in an elevated position, but so as to yield to prevent a vacuum within the chamber.

When the pressure is brought against the inner end of the piston *e*, as shown by the arrow in Fig. 2, and the weight of the load forces inward the piston and causes the circulation of the water from the inner to the outer side of the piston, the tank should communicate with the circulating-channel, (either the cylinder or circulating-pipe,) so as to receive the surplus water when the piston *e* moves back

and the water circulates, and to deliver it up to the discharge when the water is discharged from the outer side of the piston. In this case the piston P is shown as weighted to insure its descent.

It will be obvious that by using a tank or reservoir of sufficient height, extending it as in dotted lines, Fig. 2, the piston P may be dispensed with, its office being to prevent the escape of the water under pressure when a short reservoir is employed.

Suitable ropes, *t*, or other appliances, extend from the valve C′ to the cage, so that the operator therein can move it at pleasure.

I claim—

1. The combination, with the cylinder and supply, circulating, and discharge pipes and supply and discharge tanks of a hydraulic engine, and with a valve device closing communication with the supply-pipe when the supplemental water is to circulate, of a water tank or reservoir independent of the supply-tank pipe and communicating with the cylinder, and serving as a means of supplying or taking up surplus water in the circulating of the water from one side of the piston to the other, substantially as set forth.

2. A water-engine provided with means for connecting the opposite ends of the cylinder and for closing communication with the supply when the piston is to be moved by the load, in combination with a discharge-tank and a supplemental reservoir independent of the supply tank and pipes, and arranged to receive the surplus water when the water circulates, and to deliver a supply when the water is discharged, substantially as specified.

3. The combination, with the cylinder, piston, discharge and circulating pipes, discharge tank and valve of a hydraulic elevator, of a reservoir in communication with the water-circulation and containing a piston, arranged to operate substantially as set forth.

4. The combination, with the cylinder, circulating-pipes, supply and discharge pipes, discharge-tank, and a reservoir, L, of a weighted piston, substantially as set forth.

5. The combination, with the cylinder of a hydraulic engine, of a reservoir communicating with said cylinder independently of the supply, discharge, and circulating pipes and supply-tank of said cylinder, and adapted to receive or to supply the volume of fluid displaced by the piston-rod from and to said cylinder, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES E. FOSTER.

Witnesses:

A. E. T. HANSMANN,

JOHN G. HINKEL.