

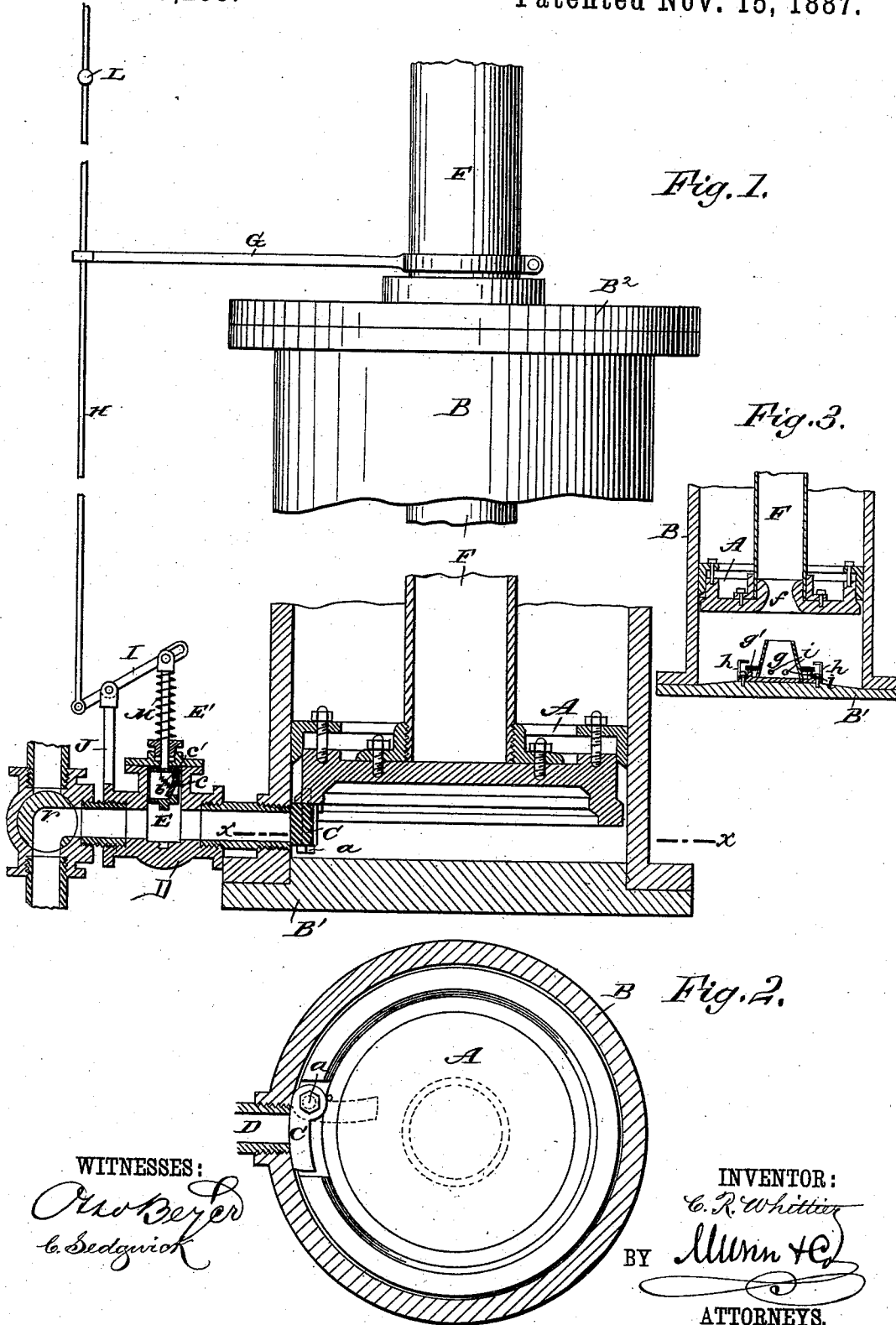
(No Model.)

C. R. WHITTIER.
HYDRAULIC ENGINE.

2 Sheets—Sheet 1.

No. 373,259.

Patented Nov. 15, 1887.



WITNESSES:
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(No Model.)

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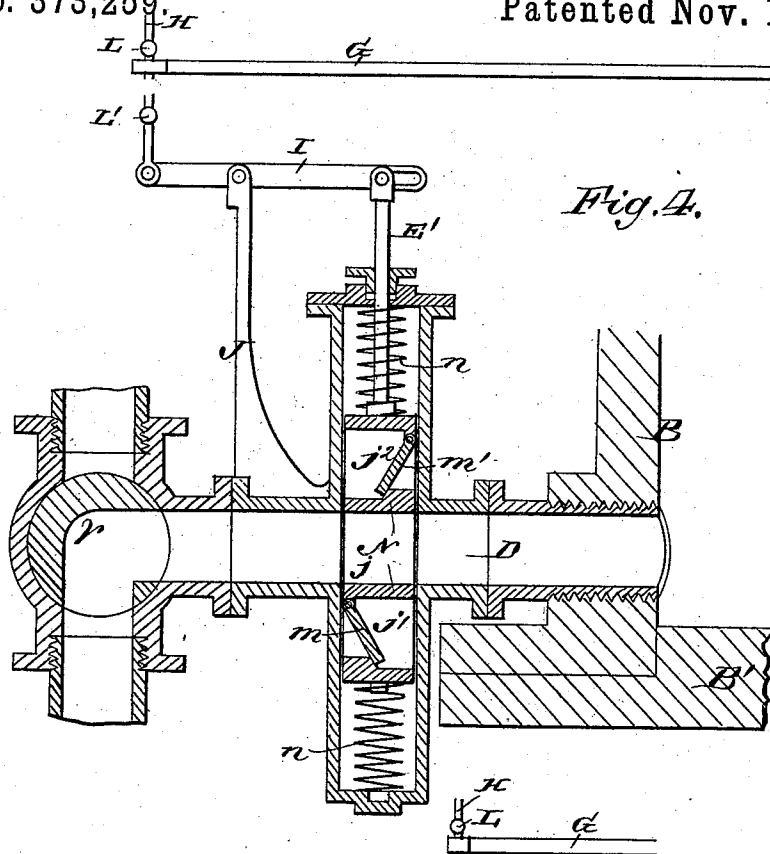
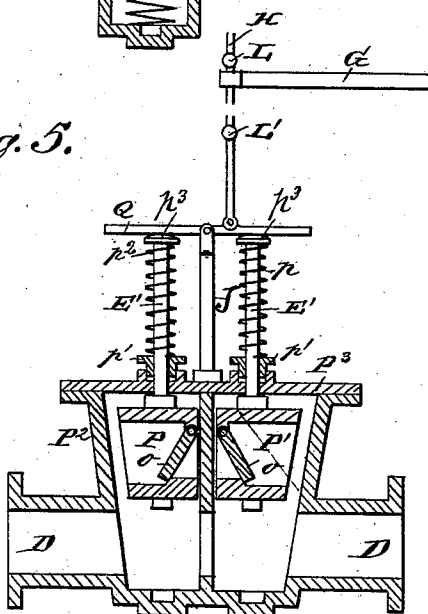


Fig. 4.

Fig. 5.



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UNITED STATES PATENT OFFICE.

CHARLES R. WHITTIER, OF YONKERS, NEW YORK.

HYDRAULIC ENGINE.

SPECIFICATION forming part of Letters Patent No. 373,259, dated November 15, 1887.

Application filed March 11, 1886. Serial No. 194,917. (No model.)

To all whom it may concern:

Be it known that I, CHARLES R. WHITTIER, of Yonkers, in the county of Westchester and State of New York, have invented a new and useful Improvement in Hydraulic Engines, of which the following is a full, clear, and exact description.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a broken plan view, partly in section, of a horizontal hydraulic engine having my invention applied thereto. Fig. 2 is a transverse section taken on the line *xx*, Fig. 1. Fig. 3 is a sectional view of the lower part of an upright cylinder and piston having a central admission, showing a modified form of one of the valves for admission at the end of the cylinder instead of the side. Fig. 4 is an inside sectional elevation showing a double-acting cut-off valve fitted in the discharge and supply pipe. Fig. 5 shows a modified form of a double-acting cut-off valve.

My invention consists, principally, in providing hydraulic engines, particularly those used for operating elevators, which have a single pipe for the combined purpose of admission and discharge, with automatic valves or cut-offs to be placed between the main operating-valve and the cylinder, or within the cylinder, for automatically and completely stopping the piston at both terminals of its movement without danger of its coming in contact with the cylinder-heads and without in any way impeding its movement in the opposite direction.

The invention also consists of the combination and arrangement of these cut-off valves, one or both being placed in the connection between the main valve and cylinder, and operated from the piston-rod to limit the outward movement of the piston, or one may be placed in this position and the other may be attached to the piston itself, or placed within the cylinder, to limit the inward or down stroke of the piston, all as hereinafter described and claimed.

Referring to Figs. 1 and 2, the piston *A* in its inward stroke in the cylinder *B* is prevented from coming in contact with the cylinder-head *B'* by a cut-off or valve, *C*, attached

to the piston, the same being arranged to close the supply and discharge pipe *D* just before the piston *A* reaches the limit of its inward movement toward the cylinder-head *B'*. The cut-off *C* may be a fixed projection to be used as a secondary valve-seat, or it may be any appropriate form of a secondary valve itself; but for simplicity I prefer to construct it as a secondary valve made to close automatically by its own weight, and for this purpose, in the horizontal form of cylinder, the cut-off is in the form of a plain flap-valve of proper width pivoted to the lower edge of the piston on the pin *a*, so that it is free to swing to the position shown in full lines in Figs. 1 and 2 by its own weight, or by a spring or by the current of water as it flows from the cylinder *B* through the pipe *D*, or to swing to the position shown in dotted lines in Fig. 2 by the current of water flowing into the cylinder through the said pipe *D*. In this manner the cut-off *C* constitutes a double-acting valve, the same acting first as a primary valve to close the pipe *D* against the outflow of water, and, secondly, as an automatic secondary inwardly-opening valve to permit the inflow of water, so that while it serves to cut off the escape of water from the cylinder *B*, it in no way interferes with the inflow of water to force the piston upward when the main valve *V* is opened for that purpose.

A modified form of valve or cut-off is shown in Fig. 3, applied to upright cylinders with a supply and discharge pipe at the end of the cylinder, instead of at the side. In this construction water is admitted to and exhausted from the cylinder through the hollow piston-rod *F* and central opening, *f*, in the piston-head *A*. The opening *f* is made slightly conical, and a hollow cut-off plug or valve, *g*, is attached to the inner surface of the head-plate *B'*, which gradually closes the opening *f* and cuts off the inflow of water before the piston reaches the cylinder-head *B'*, thus maintaining a supply of water at the lower end of the cylinder which prevents contact of the piston with the head-plate *B'*. The valve or cut-off plug *g* has openings *i*, which are covered by a secondary valve, *g'*, resting on a valve-seat adjacent to and above said opening *i*, and the stop-fingers *h* limit the opening of this sec-

ondary valve. The valve g' closes by its own weight and prevents the outflow of water from the cylinder through the openings i , when the opening f is closed by the plug g ; but on the admission of a pressure of water in the pipe F the valve g' will be lifted by the water entering the plug g and permit the inflow to exert its full pressure upon the piston A, which will recede until the plug g is unseated, thus allowing an inlet of water directly to the cylinder through the pipe F, in the usual manner.

The piston, Fig. 1, in its outward stroke is prevented from striking the top cylinder-head B' by a cut-off or secondary valve, E, fitted in the said inlet or discharge pipe D between the cylinder and the main valve V, and arranged to automatically close the pipe and cut off the inflow of water to the cylinder just before the piston reaches the limit of its outward movement. In this instance the cut-off E is operated from the piston-rod F by means of an arm, G, rod H, and lever I, which latter is connected to the said rod H and to the stem E' of the cut-off, and fulcrumed on the upright J, so that the outward movement of the rod H will force the cut-off E inward, and vice versa, the former closing the pipe and the latter movement opening the pipe D.

The outward movement of the rod H for closing the gate E is caused by the arm G striking the projection or tappet L on the rod H, and the inward movement may be produced by a spring, M, placed upon the stem E' of the cut-off, or by any other suitable means.

The cut-off E is formed with an opening, b , of about the same diameter as the pipe D, and this opening is closed by a small valve, c , of any construction, opening outward to permit an escape of water from the cylinder B through the cut-off E. The object of this escape of water from the cylinder B is to automatically allow an inward movement of the piston A, when the main valve is open, to lower the arm G from contact with the tappet L, whereupon the spring M will lift the cut-off E and open the pipe D. The valve c may close by its own weight or be seated by a coil-spring, c' .

When it seems best to place both the cut-offs before described on the outside of the cylinder, it may be done as follows: In the construction shown in Fig. 4 a single double-acting valve, N, is placed between the main valve and the cylinder to limit both the outward and the inward movement of the piston, which is operated by an arm, G, rod H, connecting-rod I, and valve-spindle E', the arm G acting in contact with the tappet L for lowering the double acting valve N and in contact with another tappet, L', for lifting the valve. While the arm G is moving between the two tappets L L' the valve N is held by the end springs, n n , in a central position, so that the central passage, j , therein registers with the inlet and discharge pipe D. The opening j is of the same diameter as the pipe D, so that the valve in no manner interferes with the inflow or dis-

charge of water while the valve is held in its central position. Below the central opening, j , is formed the opening j' , which is closed by the flap-valve m , arranged to permit the inflow to and to prevent the outflow from the cylinder, and above the central opening, j , is formed the opening j'' , which is provided with a flap-valve, m' , arranged to permit the outflow of water from and prevent the inflow of water to the cylinder. In this manner, when the valve N is forced downward by the arm G striking the tappet L, the inflow of water will be cut off from the cylinder and the outward movement of the piston stopped before coming in contact with the head-plate of the cylinder. The piston will remain stationary while there is pressure of water against the outer surface of the valve m' ; but when the valve V is reversed to permit the outflow of water from the pipe D and the cylinder the pressure of water within the cylinder will unseat the valve m' and flow freely out, which will lower the arm G from contact with the tappet L, whereupon the lower spring n will return the valve N to its central position and permit the inward movement of the piston in the ordinary manner. This will continue until the arm G strikes the tappet L', which will move the valve N upward and bring the passage j' in line with the pipe D, thus causing the flap-valve m to cut off the outflow of water and to retain a sufficient quantity in the cylinder to prevent the piston from striking the plate B', and when the valve V is again turned to admit water to the cylinder its pressure will unseat the valve-plate m and enter the cylinder in full pressure, and as soon as the arm G moves out of contact with the tappet L' the upper spring n will act to move the valve again to its central position.

In the construction shown in Fig. 5 I use two separate valves, P P', provided with oppositely-arranged flap-valves o , and provided with the spindles E', placed in the box P², connected with the inlet and discharge-pipe D. The spindles E' pass up through the cap-plate P³ to the box P², and are provided with coiled springs p p' , which act between the stuffing-boxes p' and the flanges p^3 at the ends of the spindles for normally holding the valves P P' elevated in the box P², so they will in no manner interfere with the free flow of water through the pipe D. Upon the upright J, rising from the box P², is fulcrumed the plate Q, which is connected at one side of its fulcrum to the rod H, so that the plate Q will be rocked with each movement of the rod—that is, when the arm G strikes the tappet L' and forces the rod H downward the plate Q will force the valve P' downward against the pressure of its spring and cut off the outflow, but not the inflow, of water. When the arm G is moved away from tappet L', the spring p' will lift the valve P'. When the arm G reaches the tappet L, the opposite end of the plate Q will be depressed, which will force the valve P downward and cut off the

inflow, but not the outflow, of water, and when the arm G moves from the tappet the spring p^2 will elevate the valve P and permit free passage of water through the pipe D.

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

10 1. The combination, with the cylinder, the piston, and the water supply and discharge pipe of a hydraulic engine, and the main valve V, fitted in said supply and discharge pipe, of a double-acting cut-off valve for supply and discharge pipe arranged to be closed by the piston and the water current near the end of the
15 piston's stroke, and to be opened by the pressure of the water, substantially as and for the purposes described.

20 2. The water supply and discharge pipe of a hydraulic engine, provided with a double-acting valve connected to the piston-rod so as to be closed by the outward movement of the piston and opened by the pressure of

water outward from the cylinder, in combination with a double-acting automatic valve operated by the piston as it nears the limit of
25 its inward movement for closing the water supply and discharge pipe, the latter valve being arranged to be automatically opened by the inward pressure of the water in the water supply and discharge pipe, substantially as
30 and for the purposes described.

3. The combination, with the water supply and discharge pipe D, the main valve V, the cylinder, and the piston of a hydraulic engine, of two automatic double-acting valves
35 reversely arranged, one to cut off the pipe D as to its inflow, but not to the outflow, of water, the other arranged to cut off the pipe D as to its outflow, but not its inflow, of water, substantially as described.

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Witnesses:

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NEWTON A. WING.