L. Eames

Hydraulic Engine,

No. 36,398. Patented Sep. 9, 1862.

Fig. 1

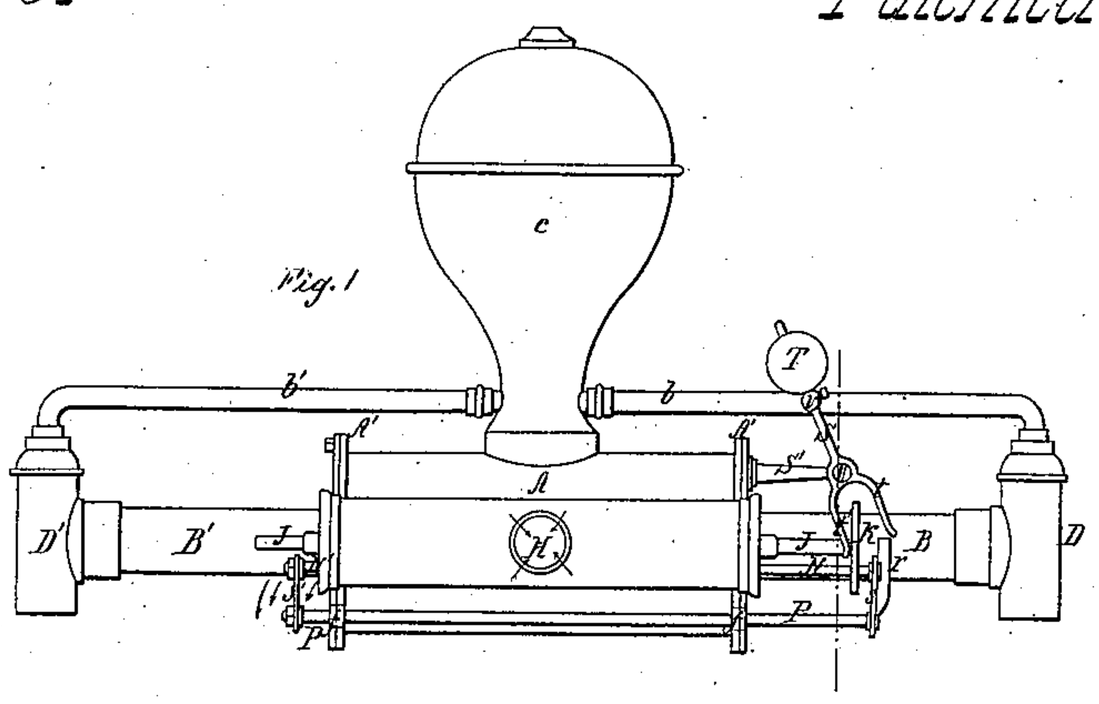


Fig. 2

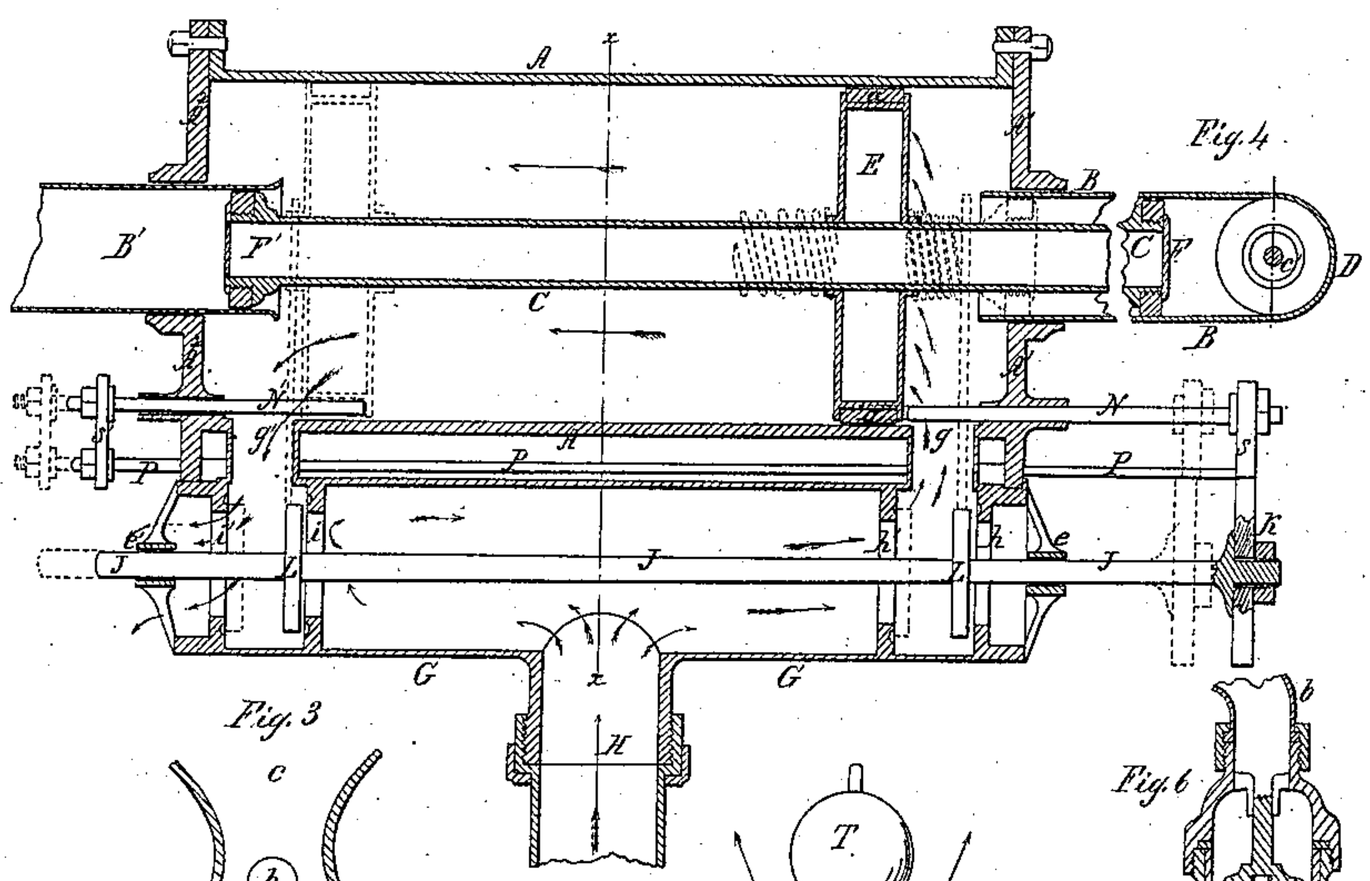


Fig. 4

Fig. 3

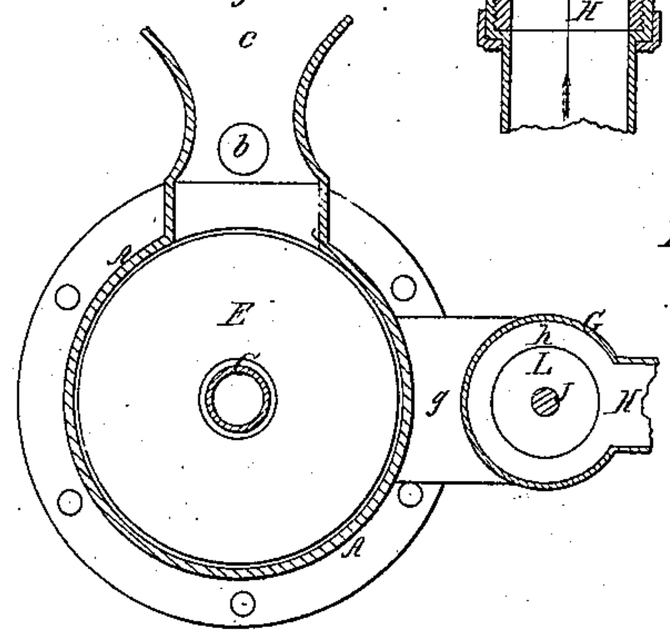


Fig. 5

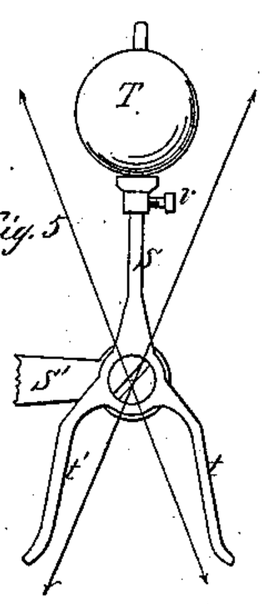
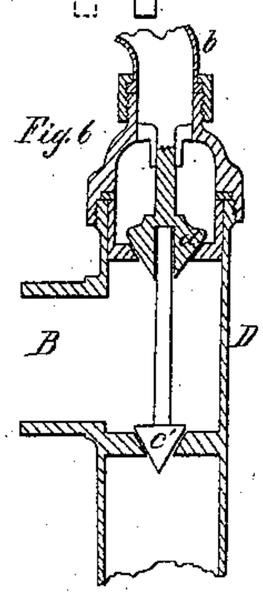


Fig. 6



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UNITED STATES PATENT OFFICE.

LOVETT EAMES, OF KALAMAZOO, MICHIGAN.

IMPROVED WATER-ENGINE.

Specification forming part of Letters Patent No. **36,398**, dated September 9, 1862.

To all whom it may concern:

Be it known that I, LOVETT EAMES, of Kalamazoo, in the county of Kalamazoo and State of Michigan, have invented a new Water-Engine; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this invention, in which—

Figure 1 is a longitudinal elevation of the engine. Fig. 2 is an enlarged horizontal section through both cylinders of the engine, showing by the aid of red lines the piston and valves in two positions. Fig. 3 is a vertical transverse section through Fig. 2, at the point indicated by red line *x x* thereon. Fig. 4 is a horizontal section through the top of one of the pumps detached from the engine. Fig. 5 shows the loaded forked lever which operate upon the valve-rod. Fig. 6 is a vertical central section through one of the pumps detached from the engine.

Similar letters of reference indicate corresponding parts in the several figures.

The object of this invention is to obtain an engine which is to be operated by water from a "head" or source, to serve as a motor for driving pumps or other machinery, and also an engine which will not be subject to the objections of water-engines hitherto used.

The nature of my invention consists in arranging alongside of a large cylinder of a suitable capacity, in which works a piston, a smaller cylinder, which is open at both ends and supplied with a peculiar arrangement of valves and valve-seats, and which communicates with the large cylinder by means of parts at or near the ends of the two cylinders, as will be hereinafter described, whereby I am enabled to cause both of the valves of the smaller cylinder to move at one and the same time and keep a space equal to the whole of one port open at all times, as will be hereinafter described.

To enable those skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A is the main cylinder, which is closed at the ends by the heads A′ A². Through central openings in these heads are secured the pipes B B′, which may project into the cylinder A short distances, if desired. Pipes B B′ project from each end of the cylinder A a suitable distance and carry on their ends the pumps D D′, the valves of which should both (two valves being in each pump) open upward, as shown in Fig. 6 of the drawings.

C is a hollow piston-rod closed tightly at both ends, and E is a large hollow piston which works back and forth in cylinder A. The piston E is formed, as shown in the drawings, with an annular groove in its periphery for receiving and keeping in place any suitable packing, *a*, which will allow the piston to play freely in the cylinder A.

F F′ are plungers which are fixed, respectively, to the ends of the piston-rod C, and as the piston E is secured to the middle of the length of its hollow rod C the plungers are of course at equal distances from the piston, and the piston, plungers, and their rod C all move together.

The valve-openings in the pumps D D′ are closed by valves, all of which open upward and allow water to be forced up through pipes *b b′* into the air-chamber *c*. The lower valves, *c′*, in these two pumps receive and hold the water drawn into the pipes B B′ as the plungers F F′ recede from their respective pumps, while the upper valves, *d*, allow the water thus raised to be forced into the air-chamber *c*, and then retain the water in this chamber.

On the outside of cylinder A is a smaller cylinder, G, the axis of which is parallel with the axis of cylinder A, and the communication between the two cylinders is at or near each end thereof. These communications or ports *g g′* each allow water from small cylinder G to pass into and out of the larger cylinder, A. The two cylinders are suitably connected together, and they are about of an equal length. I am not restricted to the size of the ports *g g′*, as these will vary in size in the same-sized engine, and the two cylinders may also vary in size one with the other. The ends of small cylinder G are both open, so that at a certain moment in the stroke of the piston E the spent water in cylinder A will freely escape through these openings, as will be further explained hereinafter.

H is the induction-orifice for the supply of water to the engine. *e e′* are the journal-bearings for the valve-rod J, and *h h′* and *i i′* are the valve-seats for the two double-faced valves L L′, which valves are secured to and move with the rod J in its alternating endwise mo-

tion. These valves L L′ each play between their respective seats—that is to say, the valve L plays between the seats *h h′*, and the valve L′ plays between the seats *i i′*, as shown in Fig. 2 of the drawings. The two valves L L′ will in consequence of this arrangement move at the same time and in the same direction, keeping at the same distance apart, and keeping a space equal to the whole of one port open at all times. It will now be seen that the force of water from the head is made to act uniformly upon the two valves L L′, making one valve counteract the pressure upon the other during the operation of the engine, thereby causing the valves to move smoothly and quietly in the performance of their work.

The valve-rod J projects out from one end of the small cylinder G, and receives a disk, K, on its end, which disk, together with the rod J and valves L L′, all rotate on their axis. This rotation is allowed merely to prevent an unequal wear of the parts.

N N′ are short sliding rods which pass longitudinally through stuffing-boxes in the ends of cylinder A (shown in Fig. 2 of the drawings) a sufficient distance for piston E to come in contact with them before this piston completes its stroke. The rods N N′ are in consequence thereof alternately pushed out at each stroke of the piston. Rods N N′ are connected together by the guide-bar P, which works through guides *f f* projecting from the flanges of cylinder A, and which is secured at its ends to the cross-heads *s s′*. The two rods N N′ being thus connected together, they will be moved together when one or the other is acted upon by the piston E. The projecting portion (lettered *r*, and shown in Fig. 1) is secured to the cross-bar *s* of the reciprocating rods N N′, and projects up or out sufficiently far to be struck by the bent legs *t t′* of the bifurcated vibrating rod S, (shown in Figs. 1 and 5,) on the upper end of which is slipped a weight, T, which may be adjusted up or down on its rod and fixed in any position by means of the sliding nut and set-screw *v*. The forked rod S is pivoted to the arm S′, which projects from the cylinder-head A′, and this arm supports the rod S and allows it to vibrate. I should here mention that the portion *r*, which acts upon the forked rod S, should project out such a distance from the head of cylinder A—when the several parts are in the relative positions shown in Figs. 1 and 2—that a perpendicular line dropped from the axis of motion of the rod S will fall between the portion *r* and the head of cylinder A. The alternate reciprocating movement imparted to the rods N N′ will now impart a vibrating movement to the rod S. The forked ends of rod S are made flat or wide enough to act upon the disk K, so as to give the valve-rod J an endwise movement at the proper time and in the proper direction for starting the valves L L′ from their seats at each stroke of the piston. In this manner the piston itself is caused to act, through the medium of the mechanism just described, upon the valves L L′ for controlling its own movement. This feature of cutting off and letting on the head of water to the cylinder A at the precise moment it is needed, so that there will be no sudden jerking or concussion on any part of the machine during its operation, is very important, as the necessity of stopping or checking the flow of water from the supply-pipe preparatory to each change of stroke is avoided, and the water will pass through the engine freely and uninterruptedly, the entire water-space in the engine being always supplied with water.

I have represented in Fig. 2, in red lines, a more compact method of causing the piston E to actuate the valves L L′, which can be made to effect the same object as the mechanism above described. This plan consists in fixing to the valve-rod J, or to the valves, forked arms, the forked ends of which encompass loosely the piston-rod C. These arms pass through the ports *g g′*, as indicated in the drawings; and in combination with these arms springs are employed, which are attached to the piston E or to its rod C, which springs will be brought to act upon valve-rod J through the forked arms, and by their recoil they will start the valves from their seats, as in the mechanism first described.

Operation: The engine represented in the accompanying drawings is intended for pumping water, the pump apparatus being shown attached; but this pump may be removed and a pitman attached to the piston-rod, as in any ordinary engine, when a motive power is desired. To commence the operation, the supply-pipe is connected to the neck H and water let into the small cylinder G. The lower ends of the pumps D D′ are immersed in water, which is to be pumped up into the air-chamber *c*, and forced therefrom for consumption. The several parts of the machine being in the positions represented in Figs. 1 and 2, the flow of water will be through the port *g* into the cylinder A, as indicated by the course of red arrows in Fig. 2, and impinging upon the piston E, the force of water will drive the piston toward the opposite end of the cylinder. During this operation the water, which we will suppose is on both sides of the piston E, is forced through the port *g′* and out of the smaller cylinder G through valve-opening *i′*, as indicated by the course of red arrows on the left of piston E, and before this piston makes its full stroke it will come in contact with the sliding rod N′ and push this rod outward. This movement which is imparted to the rod N′ is transmitted to the rod N through guide-rod P, and this rod N moves inward or toward the piston E until the portion *r* comes in contact with and has moved the forked rod S over or past its perpendicular, when the weight T will drop of its own accord and cause the arm *t* of the fork to act suddenly upon the plate K, which operation will start the valves L L′ from their seats *h* and *i* toward the opposite seats *h′ i′*, when the direction of the water will be

instantly reversed from the course indicated by the arrows in Fig. 2, and the water will now rush through port *g'* into the cylinder A on the opposite side of the piston E, while the spent water will rush or escape through port *g* and out of the end of small cylinder G through valve-opening *h*, thus starting the piston on its return-stroke. It will now be seen that the ports *g* and *g'* operate alternately as induction and eduction passages for the cylinder A; also, that while one port is an induction-passage the opposite port is an eduction-passage, and vice versa. In this way the piston E will receive an alternate reciprocating motion from a head of water passing in a continued current through the engine, and as the movement of the double-acting double valves L L' from seats to seats is so quick the water is not imperceptibly checked in its flow through the cylinders of the engine, and all concussion and reaction of the piston, valves, and water are prevented.

The solid plungers F F' operate alternately upon their respective pumps D D' in drawing water through the lower valves, *c'*, in the pump into the pipes B B', and thence forcing it up through the upper valves, *d*, into the air-chamber *c*.

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

1. So constructing and applying valves to a water-engine that they will control both ports and keep a space equal to the whole of one port open all the time, essentially as herein described.

2. The solid double-faced valves L L' in the cylinder G, valve-seats *h h' i i'*, and ports *g g'*, arranged and combined with the cylinder A and its piston E, substantially as and for the purposes herein set forth.

LOVETT EAMES.

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