(No Model.)

H. W. FORSLUND.

ENGINE.

No. 570,280. Patented Oct. 27, 1896.

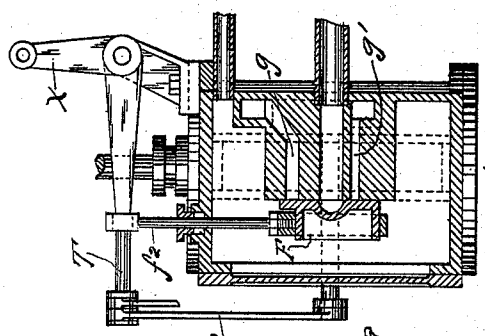

Fig. 4.

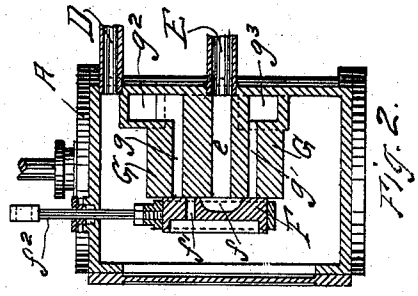

Fig. 2.

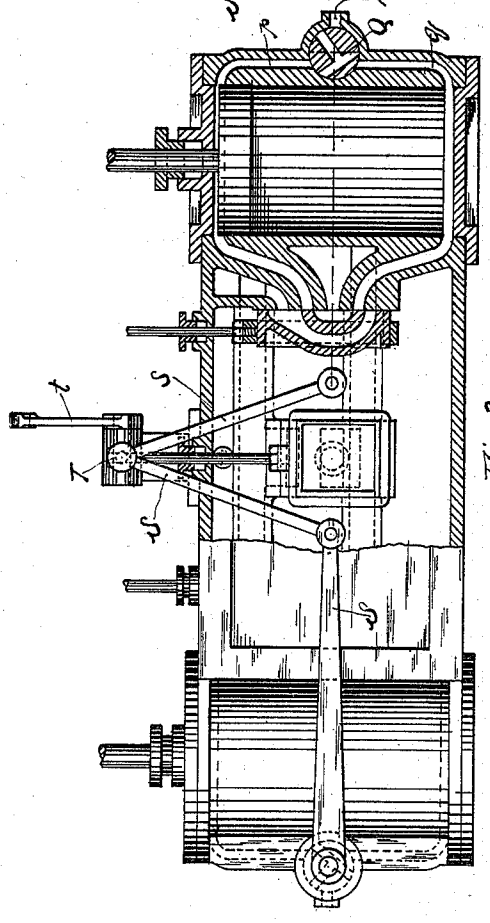

Fig. 3.

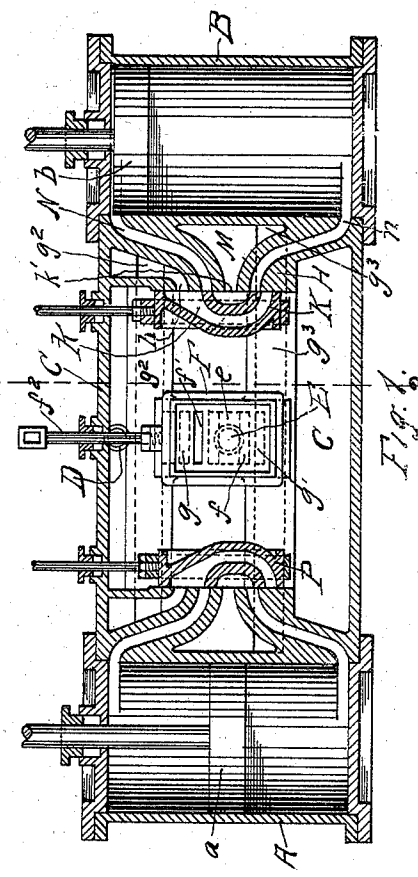

Fig. 1.

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SPECIFICATION forming part of Letters Patent No. 570,280, dated October 27, 1896.

Application filed March 20, 1894. Serial No. 504,456. (No model.)

To all whom it may concern:

Be it known that I, HUGO W. FORSLUND, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Engines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to rotative reciprocating engines in which a fluid, such as water, steam, or air, is used for power, and particularly to engines of this class which are used for hoisting purposes.

The object of the invention is to provide a valve mechanism which will admit of the engine being driven by the weight of the descending load and without utilizing any of the motive force.

The invention consists of such an arrangement of a change-valve mechanism that both ends of the cylinder may be simultaneously cut off from the exhaust and opened to the pressure, so that the engine will be practically balanced and the piston will be free to reciprocate under the effect of extraneous power applied to the crank-shaft.

In the accompanying drawings, Figure 1 represents a longitudinal section of a pair of cylinders having a common steam-chest provided with my improved valve mechanism. Fig. 2 is a transverse section on the line 2 2 of Fig. 2, the cylinder-valve being omitted. Figs. 3 and 4 are similar views showing a modified form of construction.

The drawings represent an engine specially adapted for the use of steam as a motive force. Inasmuch as the use of compressed air or of water would involve no change of construction other than that of the size of the ports, I have not deemed it necessary to show motors adapted for such use. For convenience I will describe the motor as a steam-engine.

A pair of cylinders A B, having pistons *a b*, are shown as being the counterpart each of the other, and as being served by a steam-chest C common to both. Steam enters the chest C through the service-pipe D and reaches the ports of the cylinders through the ducts g^2 g^3, which open to the chest C through ports g g' in the valve-seat G and are covered by the slide-valve F. The exhaust-pipe is shown at E, and communicates with an exhaust-port *e* in the valve-seat G, and is located between the ports g g'.

The valve F is provided with an exhaust-cavity f and a single port f'. This valve may be shifted so as to uncover the port g and open the port g' to the exhaust-port *e*, or it may be withdrawn, so as to cause the port g to register with its port f' and to uncover the port g', leaving the exhaust-port *e* covered, so that the steam will enter both of the ducts g^2 g^3. The stem of this valve is shown at f^2, and is adapted to be connected in any of the known methods to the elevator-car, so as to be controlled by the operator.

The cylinders A B are each provided with a valve P K for controlling the action of the steam therein when it is admitted to the steam-chest C. As the construction and operation are identical I will describe but one of them in detail. The seat H of the valve K is provided with ports N *n*, communicating with opposite ends of the cylinder B; the chamber M, between the two ports, and opening through the valve-seat H, and serving at times as an exhaust-chamber and being in communication with the duct g^3, and the port h in communication with the duct g^2, and opening through the valve-seat adjacent to the port N. The valve K has the usual central exhaust-cavity k', of sufficient width to connect either port N *n* with the chamber M, and it is also provided with a duct k, extending over the exhaust-cavity k', and opening at both ends through the face of the valve, one of its mouths being sufficiently extended to cover both the port h and the port N.

To hoist the elevator, the valve F is thrust in so as to open the port g to the steam-chest and the port g' to the exhaust-port *e*. Steam is delivered to the cylinder B, so as to drive the piston in, the wider end of the duct k of the valve K opening the port h to the port N and the exhaust-cavity k' opening the port *n* to the chamber M. The eccentric controlling the valve K will be so adjusted relatively to the stroke of the piston *b* that when the latter has completed its instroke the

valve K will be withdrawn, so that its exhaust-cavity k' passes the port N, opening it to the chamber M, and the smaller end of the duct k registers with the port n.

The pistons a b are connected to cranks set at an angle of ninety degrees in the usual manner.

To stop the elevator, the operator throws the valve F into the position shown in Fig. 2, so as to cut off both the steam and the exhaust. A brake mechanism may, of course, also be employed in the usual manner, but forming no part of this invention is not shown.

To allow the elevator to descend, the operator shifts the valve F, so as to uncover the port g' to the steam-chest and bring the port f' into registry with the port g, the exhaust-port e being thereby closed. Steam pressure is now applied to both ends of the cylinders A B uninterruptedly through the valves P K, and the pressure upon the opposite sides of the pistons being equal there is no impediment to the free movement of the engine under the strain of the load, except its own friction. The elevator can be stopped in its descent by shifting the valve F to its central position, indicated at Fig. 2.

The desired result may be secured by the construction shown in Figs. 3 and 4, in which the only function of the valve F is to operate the engine to hoist the elevator and to shut off both the steam pressure and exhaust for stopping. In this construction I dispense with the port f' in the valve F.

The balancing of the engine by opening both ends of the piston continuously to pressure and shutting off the exhaust is secured by means of a three-way valve Q, adapted to open a pipe R, leading from the source of pressure to ducts q r, leading to opposite ends of the cylinder, the valve being mechanically connected to the elevator-car and under the control of the operator. As shown, the valve Q is actuated by a lever S, connected by a link-rod s with one arm, T, of the bell-crank, the other arm, t, of which may be in direct communication with the elevator-car by means of a cable. The stem f^2 of the valve F may be attached to the arm T of the bell-crank, so that the valves F and Q are actuated together. The porting of the valve Q is such that the valve F may be shifted to start and stop the engine without opening either of the ducts q r to the pipe R, and the two valves are so related that when the ports of the valve Q are open to the pipe R and ducts q r, the pressure and exhaust ports g g' are both closed by the valve F. The cylinder or engine valves K P are connected up with eccentrics in the usual manner. I have not deemed it necessary to show such connections.

I claim as my invention—

1. The combination with a steam-engine, of change or reversing valve mechanism constructed substantially as described, and adapted when brought into one position to open the engine to the pressure and to the exhaust; when brought into a second position, to close the chambers upon both sides of the piston; and when brought into a third position, to open the chambers upon both sides of the piston so that the piston is free to move between a balance of pressure.

2. The combination with a steam-engine, of change or reversing valve mechanism, constructed substantially as described, and adapted when brought into one position to open the engine to the pressure and to the exhaust; when brought into a second position, to close the chambers upon both sides of the piston; and when brought into a third position, to open communication between said chambers whereby their fluid contents may be transferred from one of said chambers to the other as the piston reciprocates.

3. The combination with a rotative reciprocating engine and its cylinder-valves, of a change-valve adapted to simultaneously close the exhaust and to open both ends of the cylinder to the pressure through the cylinder or engine valve.

4. The combination with a rotative reciprocating engine and its cylinder-valves, of a change-valve adapted to simultaneously close the exhaust and open the induction and eduction ports of the cylinder-valve to the pressure.

5. The combination with a rotative reciprocating engine, service and exhaust passages, and a cylinder-valve interposed between such passages and the cylinder, of a change or reversing valve for controlling such passages and being so disposed that it may be shifted to simultaneously open them both to the source of pressure.

6. The combination with a rotative reciprocating engine having a cylinder-valve, of a change or reversing valve substantially as shown, adapted when in one position to cut off the cylinder from both the pressure and the exhaust; when in a second position to bring the cylinder into communication with both the pressure and the exhaust; and when in a third position to provide an equal pressure upon both sides of the piston.

7. In a rotative reciprocating engine, the combination of a cylinder having ports leading to both ends, and an exhaust-chamber, a piston adapted to reciprocate in the cylinder, a valve for opening the cylinder-ports alternately to the exhaust-chamber and to the pressure, a steam-chest inclosing the cylinder-valve, and having a duct, g^3, leading to the exhaust-chamber of the cylinder, and a duct, g^2 leading to the cylinder-valve and adapted to communicate with the cylinder-ports through such valve, a pressure-pipe entering the steam-chest, an exhaust-pipe leading from the steam-chest, a change-valve within the steam-chest and adapted to open the duct g^2 to the pressure and open the duct g^3 to the exhaust-pipe or to close the ducts g^2

g^3 simultaneously, or to close the exhaust-pipe and open the ducts g^2 g^3 simultaneously to the pressure, substantially as described and for the purpose specified.

8. The combination in a reciprocating engine, with a cylinder having steam-passages leading to its interior, a piston adapted to reciprocate within the cylinder, a steam-chest, and an exhaust-passage, of reversing-valve mechanism constructed substantially as described for controlling such passages and adapted when in one position to close the passages leading to the cylinder; when in a second position to open communication between the passages leading to opposite ends of the cylinder; and when in a third position to cut off communication between the opposite ends of the cylinder and to open communication between the cylinder and both the steam-chest and the exhaust-passages.

9. In a steam-engine the combination with a cylinder, a piston, and a cylinder-valve, of a steam-chest, an exhaust-port, passages leading to the cylinder, and reversing-valve mechanism, constructed substantially as described, for controlling such passages, said valve mechanism being capable of assuming three different positions, to wit: first, to open one of the passages to the steam-chest and another to the exhaust-port; second, to close all the passages; and, third, to open the passages entering opposite ends of the cylinder to uniform pressure.

In testimony whereof I affix my signature in presence of two witnesses.

HUGO W. FORSLUND.

Witnesses:
LOUIS K. GILLSON,
M. H. L. WING.