R. SCHMIDT.

Hydraulic-Elevator.

No. 203,782. Patented May 14, 1878.

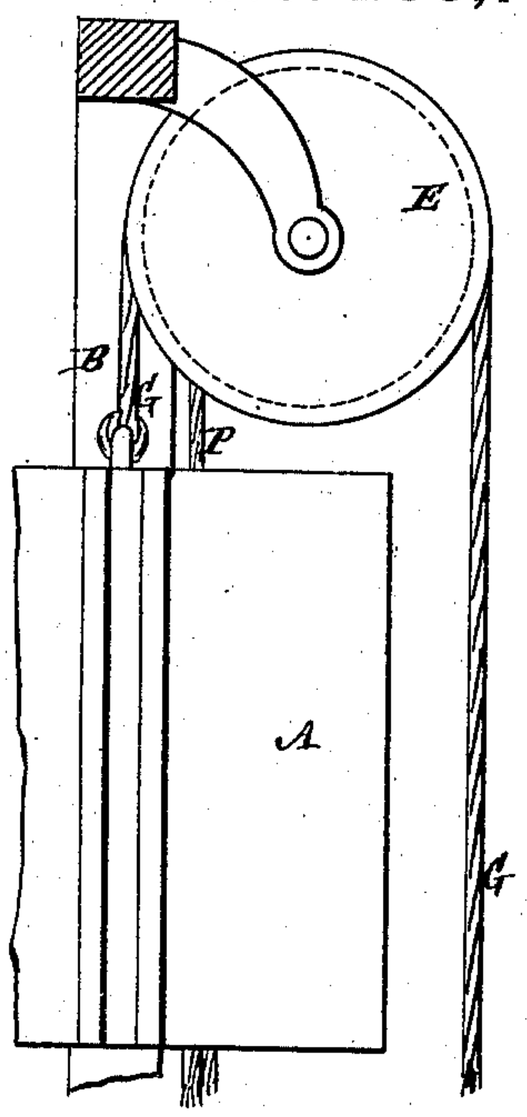


Fig. 3.

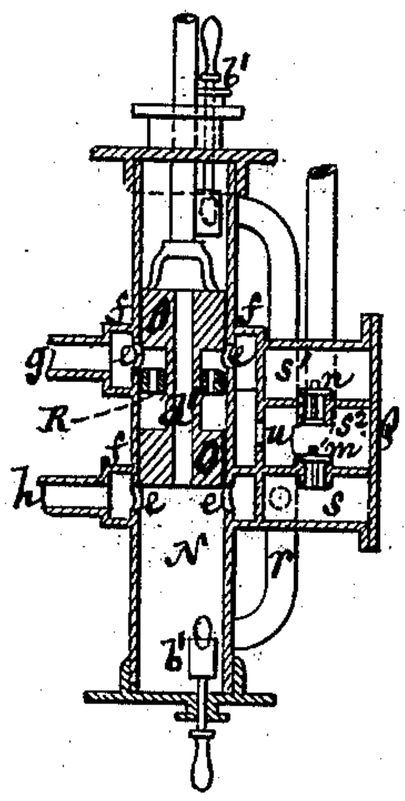


Fig. 4.

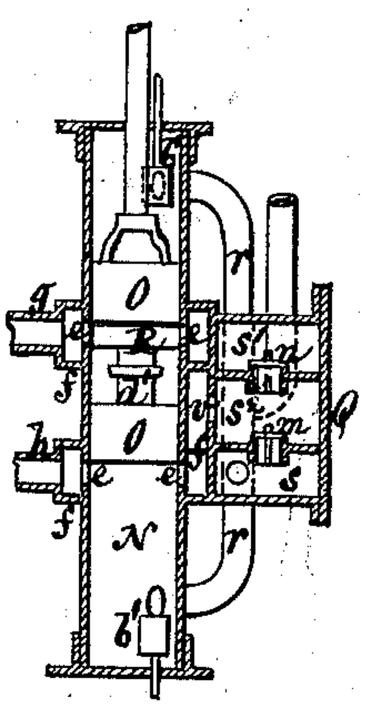


Fig. 2.

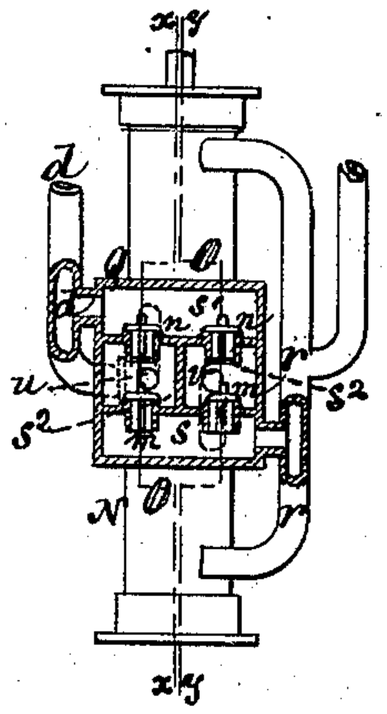
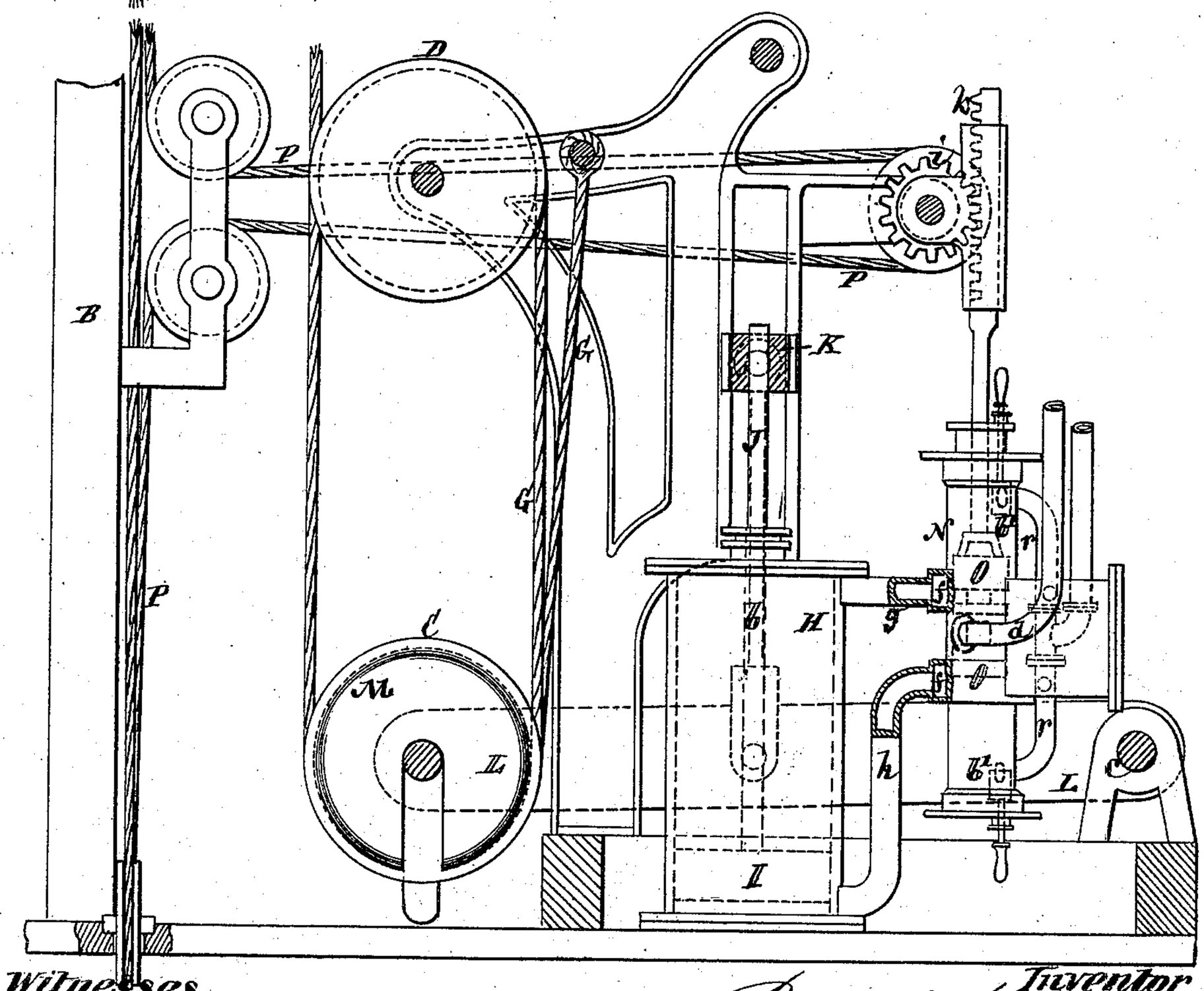


Fig. 1.



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UNITED STATES PATENT OFFICE

RUDOLPH SCHMIDT, OF YONKERS, ASSIGNOR TO OTIS BROTHERS & CO., OF NEW YORK, N. Y.

IMPROVEMENT IN HYDRAULIC ELEVATORS.

Specification forming part of Letters Patent No. **203,782**, dated May 14, 1878; application filed April 16, 1878.

To all whom it may concern:

Be it known that I, RUDOLPH SCHMIDT, of Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Hydraulic Elevators, of which the following is a description, reference being had to the accompanying drawing, forming part of this specification.

This invention more particularly relates to hydraulic engines or elevators for raising and lowering passengers or goods, in which the car or cage is actuated by a tackle device connected with a beam, which, in its turn, is connected with the piston of a double-acting water-engine, said piston receiving its reciprocating motion either by the pressure of the water or by the loaded car and a weight applied to the beam, or by both, according to the load.

In these respects the principle of operation is substantially the same as in the hoisting-machine for which Letters Patent No. 192,940 were issued to Otis Brothers & Co., as assignees of myself, July 10, 1877, and in which not only the working-space of the hoisting mechanism is economized, so as to adapt said mechanism to a room of contracted dimensions and yet obtain an extended lift, but in which the weight applied to the beam of the engine is or may be sufficient to lift a lightly-loaded car or cage, and a heavier load applied to the car or cage in the downward movement of the latter may be used to raise said weight again without using or consuming water or other propelling fluid.

The object of this invention is to produce a variable power hydraulic elevator which combines economy in water with compactness of space, and involves the use of a double piston-valve for controlling the admission and exhaust of the water to and from the working-cylinder of the engine, and in which the usual provision is made for passing the water from the exhaust-pipe into the feed-pipe, and relieving the working-piston, and also preventing a vacuum on the suction side of the latter, as well as arresting the momentum of moving machinery without shock on the water confined in the working-cylinder and its ports, as in other double-acting water engines or elevators, and in which duplicate suction and delivery valves are used.

The invention consists in a combination, with a hydraulic hoisting apparatus in which a counterbalance-weight is used to raise or assist in raising the car or cage and load, or part of the load, of a perforated disk or piston cut-off valve, operating to close by the difference of pressure in the main cylinder and supply-pipe.

The invention also consists in a combination, with the double piston or distributing-valve of the engine and a counterbalancing-weight used in connection with said engine for controlling the load, of a perforated loose disk or intermediate valve applied to the upper portion of the distributing-valve, and serving as a lap to the latter, whereby the supply-water may be economized, free from a too free opening of the supply consequent on the opening of the exhaust, as when the lap of the valve is a positive or fixed one.

Furthermore, the invention consists in a combination, with the double piston distributing-valve, having a tubular passage through it, or equivalent connection of the spaces above and below it, of adjustable gates or valves applied to the exhaust-passages from the distributing-valve, whereby provision is made for controlling the operation by more or less throttling the exhaust from the engine, and a balancing-pressure on the distributing-valve is maintained.

In the accompanying drawing, Figure 1 represents a partly-sectional side elevation of of a hydraulic elevator constructed in accordance with my invention; Fig. 2, a sectional rear view of the suction and delivery valve-chest, with its valves in connection with certain pipes or passages and the double-piston or distributing-valve cylinder. Fig. 3 is a vertical section mainly on the irregular line *x x*, and Fig. 4 a vertical section mainly on the irregular line *y y*.

A is the car or cage of the elevator, arranged to work up and down between guides or uprights B by means of a tackle device controlled by the engine, and which may consist of a set of movable pulleys, C, fixed pulleys D E, and ropes or chains G.

H is the working-cylinder of the water-engine; I, its piston, and J the rod of the latter, here represented as arranged to project

through the upper end of the cylinder and connected with a sliding cross-head, K, but which might be arranged to pass out through the lower end of the cylinder. The cross-head K is connected by rods *b* with a beam or beams, L, hinged at one end, *c*, the rods *b* connecting with the beam between said end *c* and the movable pulleys C at the opposite end of the beam. M is the weight applied to the free end of the beam, for raising or assisting in raising the car and its load.

N is the cylinder of the double-piston distributing-valve O O, into the space between the pistons of which the supply-water enters by a pipe, *d*, in the usual way. These pistons, when in the middle position of their stroke, cover a series of perforations, *e*, which lead into an annular space, *f*, that connects by pipes *g h* with opposite ends of the working-cylinder H.

The action of the apparatus for a heavy load up and a light load down is the usual one of double-acting hydraulic elevators; and the distributing-valve may be controlled, as heretofore, from the interior of the car, or elsewhere, by means of a hand-rope, P, arranged to pass round suitable idlers and controlling a pinion, *i*, which gears with a rack, *k*, on the valve-stem.

When the distributing-valve is moved upward, so that its pistons O O uncover the perforations *e*, the supply-water enters the upper end of the working-cylinder by the pipe *g*, and the lower end of said cylinder between the piston I is open to the exhaust by the pipe *h*.

The usual arrangement is provided for supply from the exhaust-pipe and relief into the feed-pipe to prevent the formation of a vacuum and to arrest the momentum of the moving machinery without shock on the water confined in the working-cylinder and ports. The suction and delivery valves *m n*, which are in duplicate and form a set similar to that of a double-acting pump, are confined in one valve-chest, Q, which is divided internally into suitable distinct spaces or chambers to secure the proper operation of the valves.

The bottom space *s* in said chest, under the suction-valves *m*, communicates with the exhaust-pipe *r*, which connects with the top and bottom of the distributing-valve cylinder N. The space s^1 above the delivery-valves *n*, which act as relief-valves, communicates with the feed-pipe *d*, and the two middle spaces s^2 s^2 between the suction and delivery or relief valves communicate, respectively, but, as usual in double-acting pumps, not together, one by a port, *u*, with the upper end of the working-cylinder H, and the other by a port, *v*, with the opposite end of said cylinder, said ports *u* and *v* opening into the annular space *f* behind the perforations *e*, through which the supply-water enters when the apparatus operates, subject to the control of the distributing-valve O O. This suction and delivery valve arrangement acts independently of the distributing-valve.

The hoisting of light loads up is done by the weight M on the free end of the beam L. The apparatus is set in motion by the operator adjusting the distributing-valve O O so as to partly uncover the perforations *e*, to control the admission and exhaust of the water from opposite ends of the working-cylinder.

Applied to the distributing-valve on the under side of its upper piston is a loose perforated disk, R, forming an auxiliary cut-off valve, which, by reason of the perforations in it, allows the water to flow through it, and from thence through the perforations *e*, controlled by the upper piston of the distributing-valve, and so on to the upper end of the working-cylinder H. Fig. 3 of the drawing shows the auxiliary or independent cut-off valve R in such relation to the distributing-valve as to provide for said supply of the water to the working-cylinder. When, however, the speed of the working-piston I becomes accelerated under the influence of the weight M, so as to lessen the pressure between the auxiliary cut-off valve R and the under side of the upper piston of the distributing-valve O O, the superior pressure beneath said loose auxiliary cut-off valve R lifts the latter and closes, as shown in Fig. 4, the admission-apertures *e*, which the upper piston of the distributing-valve controls. After this the working-piston continues its downward movement by the action of the weight M, the upper portion of the working-cylinder being then supplied with water from the exhaust, and the under portion of said cylinder delivering through the port belonging to it.

As hereinbefore observed, heavy loads down may raise the weight M up without the use of supply-water to the apparatus.

It is also necessary or desirable in some cases to throttle the exhaust by way of controlling the operation of the apparatus independently of or without interfering with the distributing-valve. To this end, I apply to opposite ends of the exhaust-pipe *r* gates or valves *b′ b′*, capable of operation from the exterior of the valve-cylinder N, which valves may be adjusted to more or less throttle the exhaust. The introduction of these gates makes it necessary to have the spaces above and below the double-piston valve O O in communication independently of the exhaust-pipe *r*, in order that there may be an equal pressure on the top and bottom of the distributing-valve, for the purpose of balancing the latter. This may be done by a separate or independent pipe or passage, opening at its ends into the valve-cylinder N above and below the double-piston valve O O; but a very simple, and at the same time a very efficient, provision for the purpose, and which is the equivalent of said independent pipe or passage, is to connect the two pistons of the distributing-valve O O by a tubular neck, *d′*, the passage in which is extended through both of the pistons of said valve.

In the apparatus which has here been de-

scribed, it will be observed that the counterbalance-weight raises or assists in raising the car and load, or part of the load, and that the hydraulic power or engine serves to overcome the inertia of the moving parts of the apparatus; also, that the perforated disk or piston cut-off valve has its closing operation controlled by the difference of pressure in the main cylinder and in the supply-pipe.

I claim—

1. In a hydraulic hoisting apparatus in which a counterbalance-weight or its equivalent is used to raise or assist in raising the car or cage and load or part of the load, and in which the hydraulic power serves the purpose of overcoming the inertia of the moving parts of said apparatus, the combination, with such apparatus, of a perforated disk or piston cut-off valve having its closing action controlled by the difference of pressure in the main cylinder and in the supply-pipe, substantially as specified.

2. In a hydraulic hoisting apparatus in which a counterbalance-weight is used to raise or assist in raising the car or cage, the combination of the automatic auxiliary cut-off valve or loose perforated disk R with the distributing-valve O O, substantially as specified.

3. The gates or valves b' b' applied to the exhaust pipe r of the distributing-valve cylinder N, in combination with the tubular connection d', or its equivalent, establishing a free communication between the reverse ends of the distributing-valve, whereby a balancing-pressure is obtained for said valve irrespectively of the adjustment of said gates, essentially as described.

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