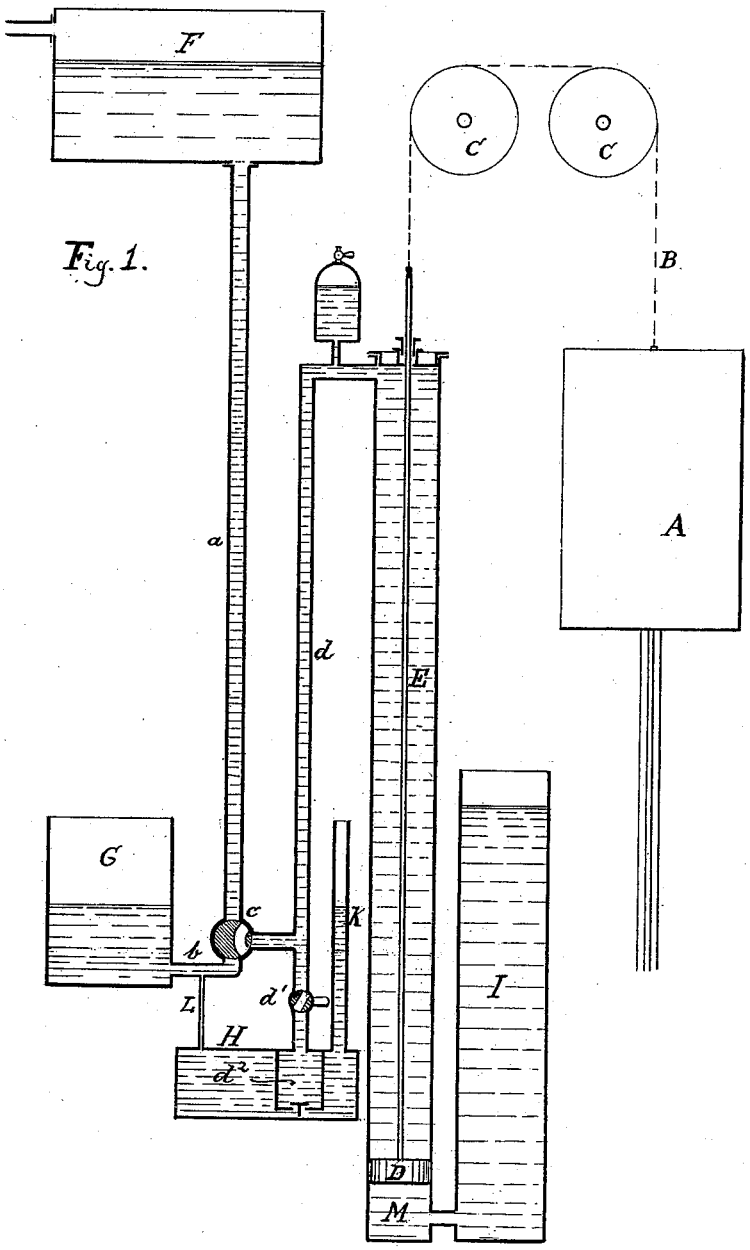
(No Model.) 2 Sheets—Sheet 1.

R. C. SMITH.

HYDRAULIC ELEVATOR.

No. 420,548. Patented Feb. 4, 1890.

Fig. 1.



WITNESSES:
Frank F. Nickel
Malcolm Mellog,

INVENTOR
Rudolph C Smith

(No Model.) 2 Sheets—Sheet 2.

R. C. SMITH.

HYDRAULIC ELEVATOR.

No. 420,548. Patented Feb. 4, 1890.

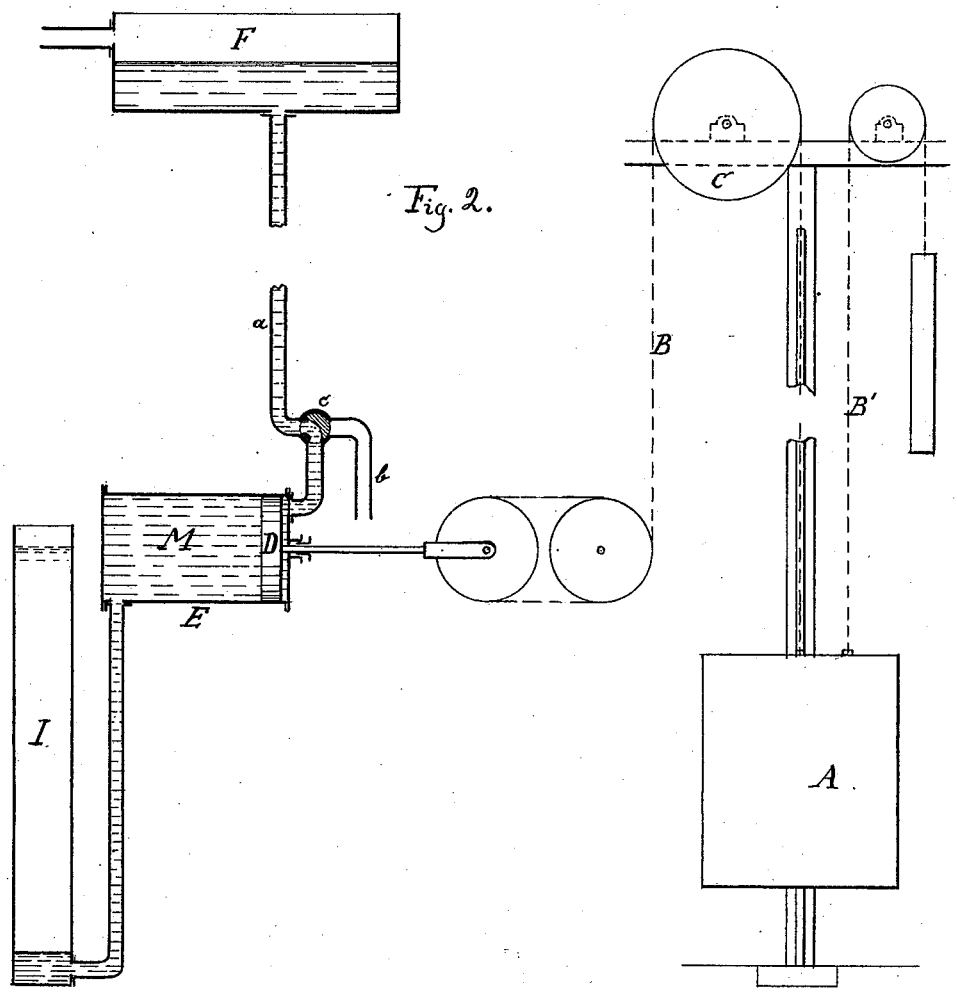


Fig. 2.

WITNESSES:

Frank F. Nickel

William Molloy

INVENTOR

Rudolph C. Smith

UNITED STATES PATENT OFFICE.

RUDOLPH C. SMITH, OF YONKERS, NEW YORK.

HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 420,548, dated February 4, 1890.

Application filed February 28, 1887. Serial No. 229,126. (No model.)

To all whom it may concern:

Be it known that I, RUDOLPH C. SMITH, of Yonkers, in the county of Westchester and State of New York, have invented new and useful Improvements in Hydraulic Elevators, of which the following is a specification.

My invention relates to hydraulic elevators having an operating-cylinder arranged in a vertical or inclined position in which the motive power to move the car varies by the variable head or by a variation of the weight of the ropes while being transferred from and to the motor side.

In the drawings, Figure 1 is a sectional elevation of a hydraulic elevator embodying my invention, and Fig. 2 is a similar view showing a modification.

A designates the elevator car or cage, fitted to travel along vertical guides and connected by hoisting-cables B, which pass over an overhead-sheave C, with a piston D, fitted to travel in an operating-cylinder E, which may be arranged either vertically or in any inclined position.

F designates an elevated tank, which represents a source of supply for water to furnish the pressure and from which a supply-pipe leads downward to the driving side of the piston and connecting into cylinder E. From this same side leads a discharge-pipe *b* to the discharge-tank G. The communication between the supply-pipe *a* and cylinder E and discharge-pipe is controlled by any of the well-known valves, a three-way plug-valve being here shown as a simple illustration of such valve.

It will be evident that a necessary element of my improved construction is the arrangement of cage, engine, and flexible connections, whereby as the length of the cable decreases between the engine and the cage, throwing the weight of the cable on the engine side of the upper guide-pulley, the counterbalancing water-column shall correspondingly increase in such proportion that the increased weight of the water-column shall counterbalance the increased weight of that part of the cable on the engine side of the pulley.

When the valve C is shifted to cut off the supply of water to the cylinder, the piston by its accumulated energy has a tendency to continue its motion, whereby a suction is produced in the driving side of the cylinder, by which water will be drawn upward through the pipe *d*, and sufficient retardation or brake-power exerted to arrest the motion of the elevator. This water-column brake has been fully described in United States Letters Patent No. 357,345, granted to me February 8, 1887. The idle side of the cylinder is connected by means of a pipe with a stand-pipe I, into which the contents of this side of the cylinder are discharged when the car ascends, and from which they are lifted when the car descends.

The use of a tank for the purpose of counterbalancing the variation in the weight of the water-column is old. I do not claim it. The objects of my invention are to counterbalance and equalize as far as possible the varying influence of the weight of the ropes. I have also provided new and useful means for supplying the reservoir H of the water-column brake, for which brake United States Letters Patent No. 357,345 was granted to me February 8, 1887.

In carrying out my invention in an elevator-engine in which the car is moved by surplus pressure on the driving side of the piston from any suitable source, as an elevated tank, an accumulator, or weighted plunger, I connect the idle end M of the cylinder by means of a pipe with a stand-pipe I of such proportions and position that the variation of the level of the water discharged from the idle end varies the pressure on the idle side of the piston to correspond to the variation in the weight of the ropes due to the difference in the lengths hanging down on the car side and those on the motor side while the car rises or descends. I am not aware that a stand-pipe of such predetermined proportions and location has ever been used. This stand-pipe should be of the same contents as the space displaced by the piston when making a full stroke to raise the car from bottom to top. Its area must be such as to make the variation in the water-level, and the consequent pressure on the idle side of the piston, correspond to the variation in the lifting capacity due to the varying weight of the ropes referred to the piston area. For instance, if the variation of the lifting capac-

ity referred to the square inch of piston area was three pounds, the depth of the stand-pipe should be seven feet and its area such as to give the same contents as the displacement of the space traveled by the piston in completing its stroke. In a vertical cylinder it should be located, as shown on Sheet 1, with the level seven feet above the lowermost position of the piston. If applied to horizontal or inclined cylinders, its level, when full, should be below the center of the cylinder and sink to seven feet below while the car descends. Sufficient weight must be left in this case in the car to lift the rope on the engine side when in its uppermost position, and the variation in the lifting capacity is made up by the variation of the tank-level, which in this case causes the pressure on the idle side of the piston to fall gradually below that of the atmosphere. (Sheet 2.)

To keep the supply constant in reservoir H, from which the water is lifted whenever the operating-valve is closed, as before described, I connect it by a small pipe L to the discharge-tank G. I also carry a pipe K of ample size up to the height of the overflow for the discharge-tank and leave it open to the atmosphere. The small pipe L will keep the water in the brake-reservoir and pipe K at the same level as that in the discharge-tank; but as soon as the water is lifted into the cylinder for furnishing the brake-power, as above described, the water-level will sink below that of the discharge-tank, as the pipe L is not large enough to replace the water consumed. The pipe K allows the atmospheric pressure to act on the water-level in the small reservoir and forces it into the main cylinder E.

Without limiting myself to the precise construction and arrangement of parts shown,

I claim—

1. The combination, in an elevator, of a cage-engine, with its cylinder connected with the water-pressure pipe on one side of the piston, and communicating at the other with a vertical water-receptacle arranged below the top of the cylinder and open at the upper end, and flexible connections between the cage and engine extending over an upper guide-pulley, the water-receptacle being relatively proportioned to the cables, as described, so that the water column in the receptacle shall at all times substantially counterbalance the weight of the cables, substantially as set forth.

2. The combination, with an elevator car or cage, of a piston and cylinder for operating the same, a suction-pipe leading downward from the cylinder on that side of the piston to which a liquid under pressure is supplied for making the working-stroke, a check-valve in said suction-pipe, an open tank, the said suction-pipe being extended into the tank, a small pipe leading from the discharge-tank to the open tank, and an outlet at the level of the overflow from discharge-tank, for the purpose described.

RUDOLPH C. SMITH.

Witnesses:

FRANZ F. NICKEL,

WILLIAM MOLLOY.