

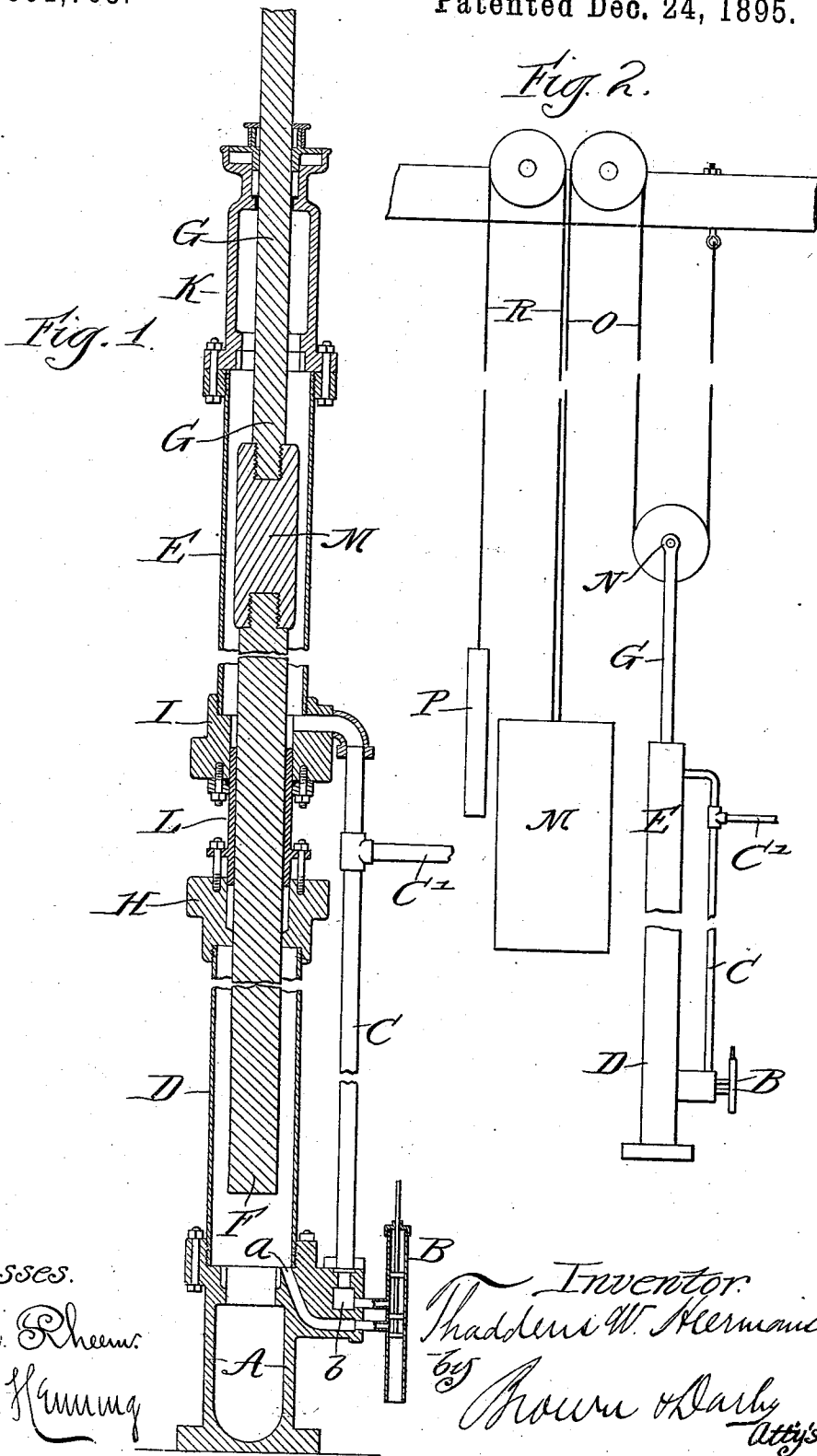
(No Model.)

T. W. HEERMANS.
HYDRAULIC ELEVATOR.

2 Sheets—Sheet 1.

No. 551,765.

Patented Dec. 24, 1895.



Witnesses.

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(No Model.)

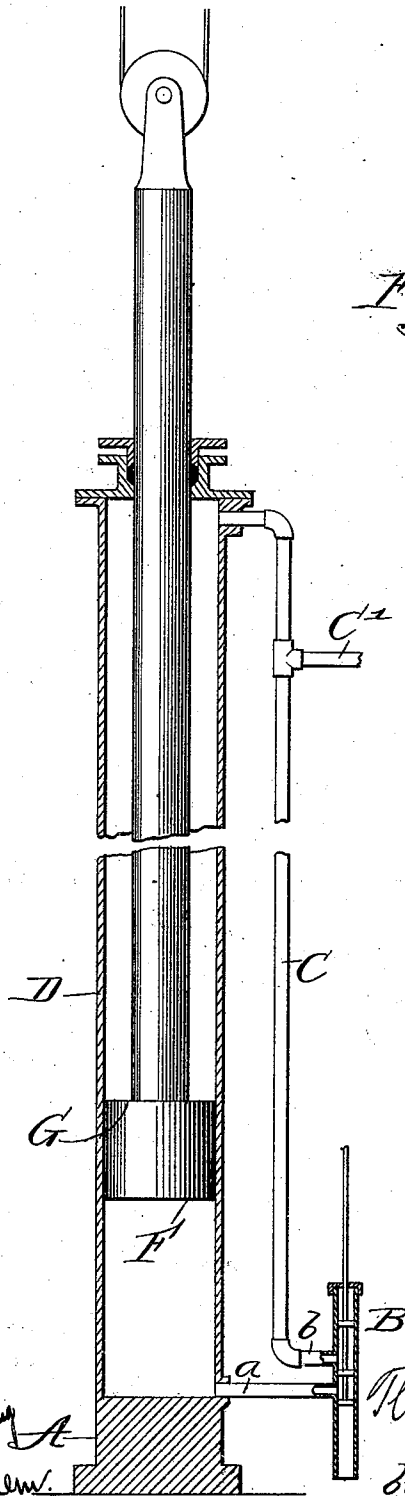
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Fig. 3.



Witnesses

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UNITED STATES PATENT OFFICE.

THADDEUS W. HEERMANS, OF EVANSTON, ILLINOIS.

HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 551,765, dated December 24, 1895.

Application filed July 19, 1895. Serial No. 555,525. (No model.)

To all whom it may concern:

Be it known that I, THADDEUS W. HEERMANS, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Hydraulic Elevators, of which the following is a specification.

This invention relates to improvements in hydraulic elevators of the type known as "vertical" machines.

The invention consists substantially in the construction set forth in the subjoined specification, and more particularly pointed out in the claims.

Like letters refer to the like parts in the several figures of the drawings, in which—

Figure 1 illustrates a vertical longitudinal section of the preferred form of the apparatus. Fig. 2 illustrates in side elevation an outline of the improvement connected to a car or cage, and Fig. 3 illustrates a vertical longitudinal section of a modified form of the apparatus.

The present invention does not embrace an entire elevator, but only certain improvements pertaining to the motor for operating the elevator. In this vertical type of machine it is customary to mount the cylinder upon a base or platform, and, accordingly, such base or platform is shown in the accompanying drawings, and is designated by the letter A. This base may be formed of a hollow casting, as shown in Fig. 1 of the drawings, provided with suitable ports *a b*, communicating respectively below and above, as indicated.

Referring to Fig. 1 of the drawings, the port *a* communicates with a lower cylinder D, and through a pipe C with an upper cylinder E. A supply-pipe C' communicates with the circulating-pipe C at any convenient point, and a valve B, of any well-known construction, is provided for the purpose of putting the pipe C and the cylinder D in communication with each other, and thereby opening a communication between the two cylinders D and E. This valve B also regulates the admission and discharge of water to and from the cylinder D, and is an ordinary piston-valve. The lower end of the cylinder D is open and communicates with the hollow base A and is secured thereto, and the upper end of such cylinder is secured to a head H.

The other cylinder E is secured at its upper and lower ends respectively to heads I and K, and between the heads H and I it is preferred to employ stuffing-boxes L, of a well-known construction, so as to make a watertight joint between these heads and the lower piston F, which passes through the same. A stuffing-box may also be provided at the point where the upper part or stem of the piston G passes through the head. In this improvement the piston of the motor must be constructed so as to provide different areas for the water-pressure to act upon at different points. It is manifest that these different areas may be secured by a variety of constructions, and in the present drawings there are shown two forms of such construction. The preferred form is shown in Fig. 1 of the drawings, in which the piston is of the ram or plunger type, and is composed of two members F and G, joined by a coupling M, which latter in practice has an additional office to perform in the elevator, which does not relate to the present invention, and, therefore, need not be specified. The member F is of twice the area of the member G, or, rather, the area of the surface presented to the water-pressure is twice as great with the lower member as with the arrangement presented by the connection of the upper member to such lower member of the interposed coupling.

Instead of having the piston composed of two members connected to each other, directly or indirectly, and arranged in two independent cylinders, it is manifest that two cylinders may be connected so as to form one and the two members of the piston joined, which modified construction is illustrated in Fig. 3 of the drawings. In this figure of the drawings, A designates the base, D the cylinder and F and G, respectively, the lower and upper sides of the piston, which are arranged to present different areas of surface to the water-pressure by reason of the fact that the upper side of the piston is connected to a large stem, which occupies about half of its area, and thus proportionately reduces its effective surface. The circulating-pipe C and supply-pipe C' and the valve B and the small pipes *b* and *a* are arranged in this figure in a similar manner to that in which they are arranged in Fig. 1 of the drawings.

In Fig. 2 of the drawings an outline of the improvement is shown as applied to operating an elevator-cage M, which cage may be connected to a sheave N, secured to the top of the piston or piston-rod by a cable O, attached to the top of the cage and passing over one or more stationary sheaves arranged at the top of the elevator-well, under the sheave or sheaves secured to the piston-rod, and up through an eyebolt or other suitable fastening device at the top of the well. A counter-weight P is preferably employed to counter-balance the weight of the cage without the load, and may be connected to the top of the cage by a cable R, passing over one or more sheaves and down through the cage.

The operation of the improvement may be described as follows: To lift the cage or car with its load the valve is shifted so as to allow the water to be discharged or exhausted from underneath the piston and supplied above the same, whereby said piston is depressed and the cage or car lifted. Then, to reverse the movement of the car, the valve is shifted, so as to allow the supply to pass through the pipes C C' and b a below the piston, or to the point where there is the greatest area of pressure-surface, and thereby produce at that point a pressure which is about twice as great as the pressure above, and consequently will overcome the pressure above and also the weight of the piston and its connections, and thus allow the car or cage to descend. In thus lifting the piston power is stored by reason of the fact that it is in a vertical position, and its weight, which has been lifted, remains suspended upon the column of water; but when such water-pressure is removed from underneath the piston it will descend by gravity and thus exert the power stored in lifting the same, and in descending its gravity will assist in lifting the load. It will thus be seen that inasmuch as there is a constant supply of water to the smaller or upper area of piston-surface the pressure will be upon it all the time; but when the water-pressure is admitted to the larger area of piston-surface the effect will be that this greater area of pressure-surface will give greater power and overcome the water-pressure upon the smaller area, and therefore lift the piston and allow the car or cage to descend, and at the same time store up just as much energy as was required to lift the weight of the piston, so that when the water-pressure is no longer exerted upon the larger area of the piston and the discharge therefrom is open there will be available for lifting the load not only the water-pressure upon the smaller area of the piston, but also the weight of the piston and connections, from which it follows that there is a uniform demand on the pumping plant, and that a smaller pump than is usual is required and a more constant service. The demand on the pumping plant may be stated as follows, to wit: The water-

pressure must be sufficient when acting on the smaller area of piston-surface to lift the load minus the weight of the piston and connections, or, in other words, the water-pressure plus the weight of the piston and connections is sufficient to overcome the load, and, therefore, the cage with its load will descend whenever there is sufficient power applied to lift the weight of the piston and connections. To state it differently, the water-pressure as supplied from the pumping plant must be sufficient to overcome the weight of the equivalent of just one-half of the maximum load, whether the car is going up or down, and the power required to be exerted is given us by the difference in surface area presented by the piston at different times to the water-pressure, and there is not created any different demand on the pumping plant. It is, of course, to be understood that it is preferable that the weight of the cage and cables is to be counterbalanced in the usual manner, as heretofore described, and as shown in Fig. 2 of the drawings.

It is obvious that many modifications may be made in the details of the construction without departing from the principle of the invention.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In a hydraulic elevator, a piston, having two distinct areas of pressure surface, the lower one of which is twice as great as the other, in combination with pipes forming a communication between the water supply and the two distinct areas of pressure surface mentioned; substantially as and for the purpose set forth.

2. In a hydraulic elevator, a piston, of approximately the weight of half the maximum load, and having two distinct areas of pressure surface, the lower surface being twice as great in area as the other, and suitable pipe communications between the water power and these different areas of piston; substantially as and for the purpose set forth.

3. In a hydraulic elevator of the vertical machine type, the combination with an upper cylinder and a lower cylinder, of a piston composed of two members having respectively different areas of pressure surface, the smaller being placed in the upper and the larger in the lower cylinder, a circulating pipe between the two cylinders and having free communication with the upper cylinder, and a valve between such circulating pipe and the lower cylinder for controlling the supply and discharge to and from the same; substantially as and for the purpose set forth.

In witness whereof I have hereunto set my hand this 17th day of July, 1895.

THADDEUS W. HEERMANS.

Attest:

FRANK T. BROWN,
M. I. CAVANAGH.