

No. 709,974.

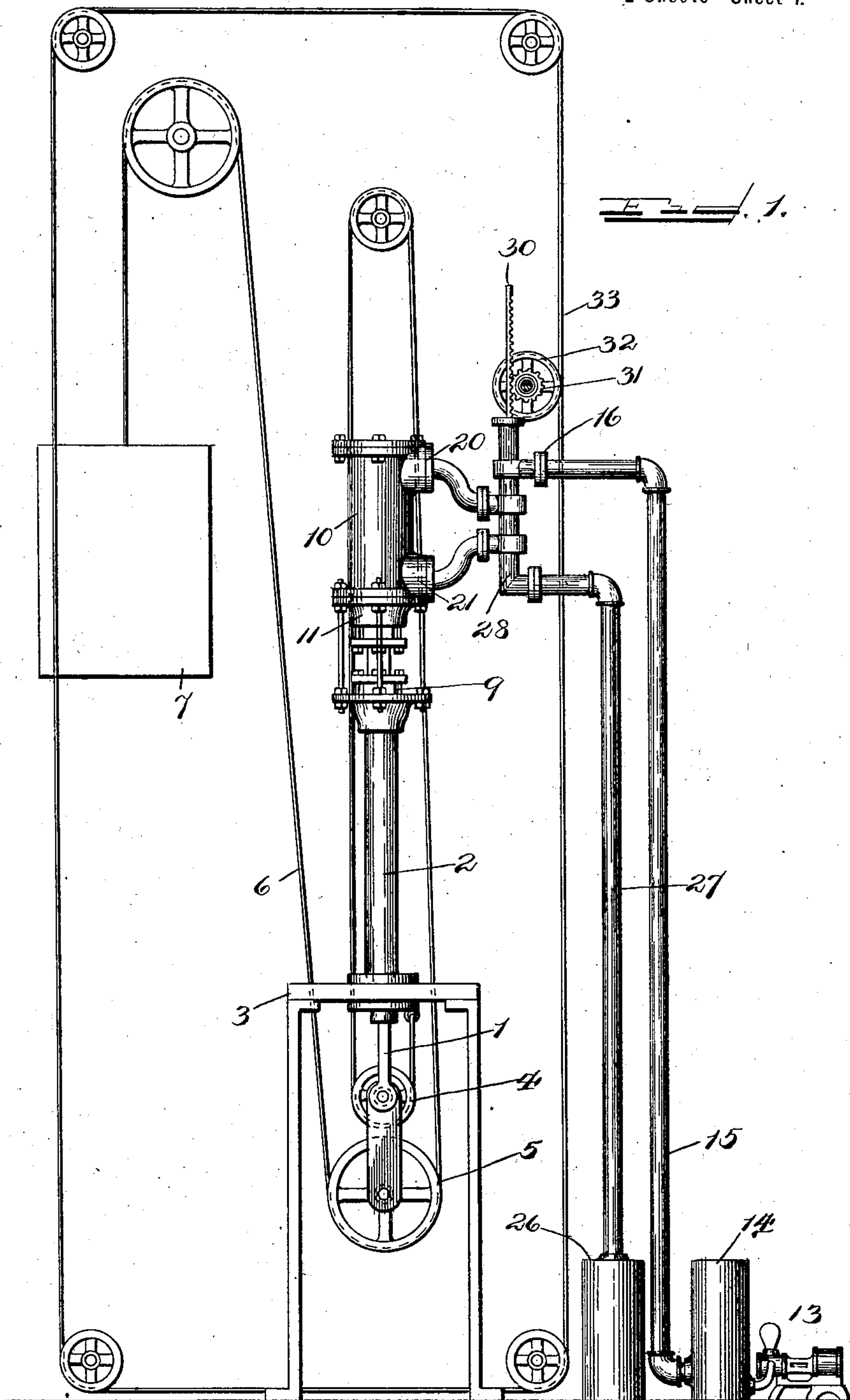
Patented Sept. 30, 1902.

C. E. ENNES.
ELEVATOR.

(Application filed Feb. 2, 1901.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES
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ELEVATOR
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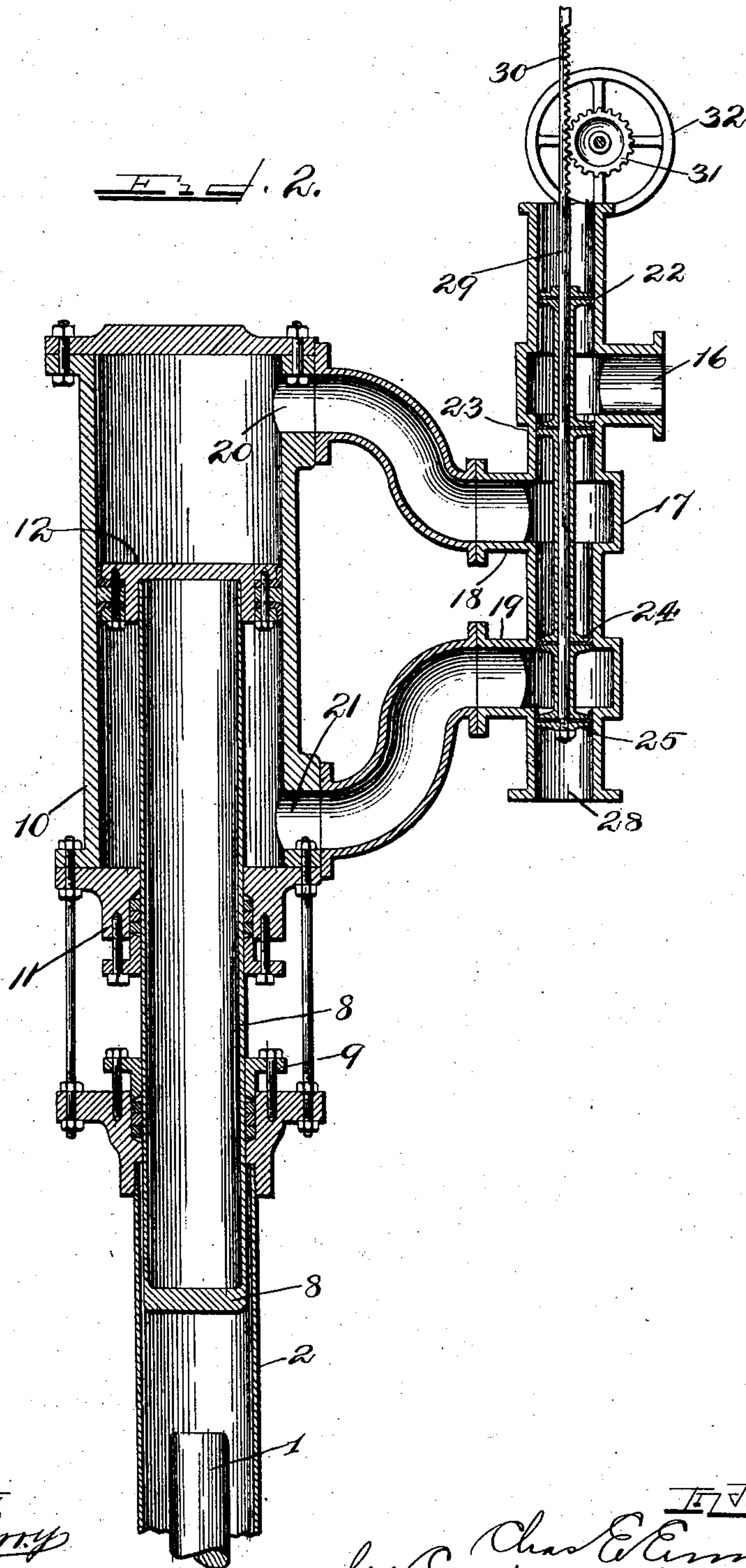
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UNITED STATES PATENT OFFICE.

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JOSEPH RICE, OF CHICAGO, ILLINOIS.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 709,974, dated September 30, 1902.

Application filed February 2, 1901. Serial No. 45,680. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. ENNES, 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 Elevators, of which the following is a full, clear, and exact specification.

My invention relates to hydraulic elevators of that type which require a pump for supplying pressure during the ordinary or normal operation of the elevator and a source of stored pressure for supplying the elevator with the necessary pressure when the pump is inactive; and my invention has for its primary object to do away with the high-pressure pump and pressure-accumulator, as well as with the costly pilot-valve mechanism and to operate a high-pressure elevator by means of a low-pressure pump or by low pressure supplied in any other way.

With these ends in view my invention consists in certain features of novelty in the construction, combination, and arrangement of parts by which the said objects and certain other objects hereinafter appearing are attained, all as fully described with reference to the accompanying drawings, and more particularly pointed out in the claims.

In the said drawings, Figure 1 is a diagrammatic illustration of a high-pressure elevator mechanism or system constructed according to my invention, and Fig. 2 is an enlarged detail vertical sectional view of the valve mechanism and receiving and elevator cylinders and piston and high-pressure plunger for imparting motion to the elevator-plunger hereinafter described.

1 represents the elevator-plunger, which works vertically in a tight elongated elevator-cylinder 2, supported upon a frame or pedestal 3 in the usual or any suitable manner. The lower end of this elevator-plunger 1 is connected to the sheaves 4 5, which operate the car-cable 6, 7 being the car which is raised by the downward movement of the elevator-plunger 1 and allowed to descend, as usual, when the elevator-plunger 1 is permitted to rise or return.

The elevator-cylinder 2 is of considerably larger diameter or cross-area than the elevator-plunger 1, the upper end of which appears

in Fig. 2, and in the upper end of the elevator-cylinder 2 works a larger plunger 8, which may be termed the "high-pressure" plunger or "differential" piston and serves to depress the elevator-plunger 1 by displacing liquid in the elevator-cylinder 2. The high-pressure plunger 8 is shown in the form of a hollow rod for the sake of lightness and the saving of material; but it will nevertheless be understood that a solid form will be equally applicable. It passes upwardly through a suitable stuffing-box 9, secured on the upper end of the elevator-cylinder 2, and enters the lower end of a receiving or low-pressure cylinder 10, the latter being also provided with a stuffing-box 11, and in this receiving or low-pressure cylinder 10, which is of considerably larger diameter or cross-area than the high-pressure piston 8, it is provided with a low-pressure piston 12 of much larger diameter than the high-pressure plunger 8.

By the described means it will be seen that when pressure is admitted to the upper end of the receiving or low-pressure cylinder 10 it will depress the piston 12 and force the high-pressure plunger 8 downwardly in the elevator-cylinder 2, and thereby depress the elevator-plunger 1 a distance equal to the distance which the high-pressure plunger descends multiplied by the difference between the size of the high-pressure plunger 8 and the elevator-plunger 1. Thus if the high-pressure plunger 8 be twice the cross area or diameter of the elevator-plunger 1 the latter will descend twice as far as the former. When the elevator-car descends, forcing the elevator-plunger 1 upwardly in the elevator-cylinder 2, the liquid displaced by the elevator-plunger 1 will return the high-pressure plunger 8 to its normal or former elevated position, the pressure above the low-pressure piston 12 being relieved. It will also be seen that the pressure exerted by the high-pressure plunger 8 against the liquid in the elevator-cylinder 2 will be equal to the pressure of the liquid admitted to the upper end of the receiving or low-pressure cylinder 10 multiplied by the number of square inches contained in the area of the low-pressure piston 12, and the pressure exerted by the displacement of the liquid in the elevator-cylinder 2

against the elevator-plunger 1 will be equal to the pressure exerted per square inch by the high-pressure plunger 8 against the fluid in the elevator-cylinder 2 multiplied by the square area of the elevator-plunger 1. Thus assuming the area of the low-pressure piston 12 to be one hundred and fifty-two square inches and the pressure of the liquid admitted above it to be two hundred pounds to the square inch and the area of the high-pressure plunger to be thirty-eight square inches the pressure exerted by the high-pressure plunger 8 will be eight hundred pounds per square inch, the ratio of the areas of the low-pressure piston and high-pressure plunger being four to one, and if the area of the elevator-plunger 1 be nine and six-tenths square inches the total pressure exerted against it will be seven thousand six hundred and eighty pounds.

The low-pressure cylinder 10 may be supplied with liquid under pressure from any suitable source. I have shown for the purpose an ordinary low-pressure pump 13, which delivers into a pressure-tank 14, from the bottom of which the liquid is conducted by pipe 15 to an inlet-port 16 of a valve-housing 17. This housing 17 has two ports 18 19, connected, respectively, to ports 20 21 at opposite ends of the receiving-cylinder 10, and within the valve-housing 17 is arranged a balanced piston-valve having pistons 22 23 24 25 so constructed and arranged that by reciprocating movement of the valve pressure may be admitted to the upper end of the low-pressure cylinder 10 from the pump and pressure-tank for forcing the piston 12 downward, and thereby raising the elevator and the liquid below the piston 12 permitted to escape through the port 19 into any suitable discharge-tank 26 through suitable pipe connection 27, which may be coupled to an outlet-port 28 of the valve-housing 17. This valve is also capable of placing the ports 20 21 in communication around the piston 12, so as to balance the fluid above and below the latter and permit it to ascend as the elevator-car descends.

In order that the valve may be manipulated for bringing about the various conditions, as described, it has an operative connection of any suitable form extending to the elevator-car. For example, the valve-stem 29 is provided with a rack-bar 30, which is engaged by a pinion 31, connected to a pulley 32, around which passes the valve-rope 33, leading through the car, so that by pulling said rope in one direction the piston 23 will be carried above the port 16, thereby placing the latter in communication with the upper end of the low-pressure cylinder 10, thus raising the elevator-car, the outlet-port 21 being at

the same time placed in communication with the discharge-port 28 of the valve-housing by the lifting of the piston 25 out of said port 28. When the valve-rope is pulled in the opposite direction, the pistons of the valve may be returned to their present position for stopping the elevator, the present position of the valve being such as to trap the liquid in the low-pressure cylinder both above and below the piston 12, or the valve may be still further depressed until the ports 18 19 are placed in communication, whereby the liquid above the piston 12 may pass into the lower end of the low-pressure cylinder as the elevator-car descends.

By the described means it will be seen that I entirely dispense with the necessity of a high-pressure pump and at the same time I gain from the low pressure admitted to the cylinder 10 sufficient high pressure to operate a high-pressure elevator. It is also seen that I dispense with the pressure-accumulator and the costly pilot-valve mechanism and its connections heretofore employed in high-pressure elevators.

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

An elevator comprising an elevator-plunger, an elevator-cylinder surrounding, and of greater internal diameter than, the elevator-plunger, having a stuffing-box, a receiving-cylinder of greater internal diameter than the elevator-cylinder, having a stuffing-box of the same internal diameter as the stuffing-box of the elevator-cylinder, a high-pressure plunger of the same diameter as the internal diameter of the elevator-cylinder and working through the stuffing-boxes and in both the elevator-cylinder and receiving-cylinder, having a piston of the internal diameter of and working in the receiving-cylinder, a valve-housing having inlet, outlet and intermediate ports, the ports connecting the receiving-cylinder, at opposite sides of the piston with the intermediate ports, a balance piston-valve having four pistons for controlling the ports in the valve-casing and means for operating the piston-valve so that pressure may be admitted to the outer end of the receiving-cylinder for forcing the piston of the latter inward while permitting the liquid on the inner side of the piston of the receiving-cylinder to escape, and for placing the ports of the receiving-cylinder in communication through the intermediate ports of the valve-casing, substantially as set forth.

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