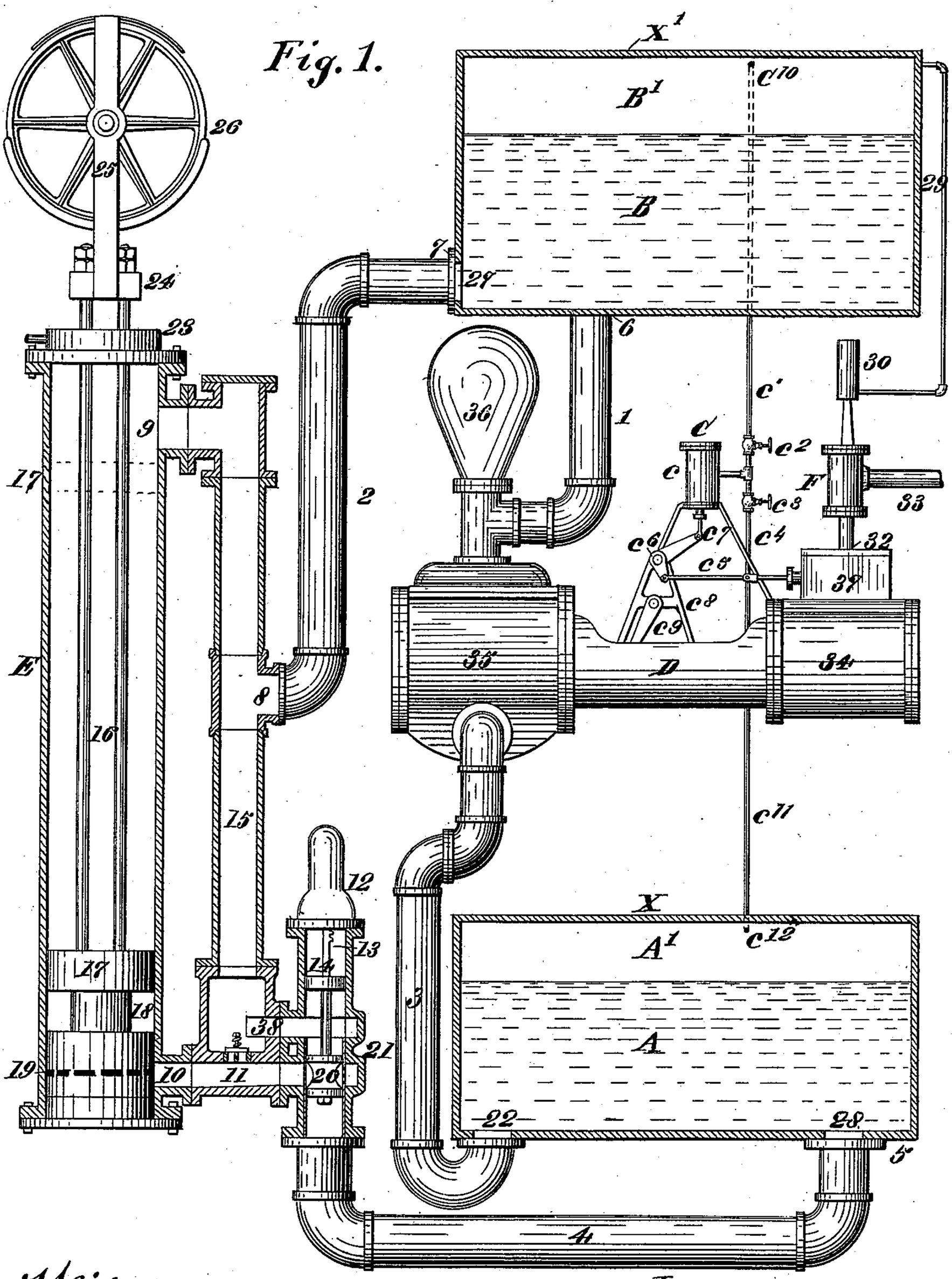
(No Model.) 2 Sheets—Sheet 1.

J. R. WADE.

HYDRAULIC ELEVATOR.

No. 528,281. Patented Oct. 30, 1894.

Fig. 1.



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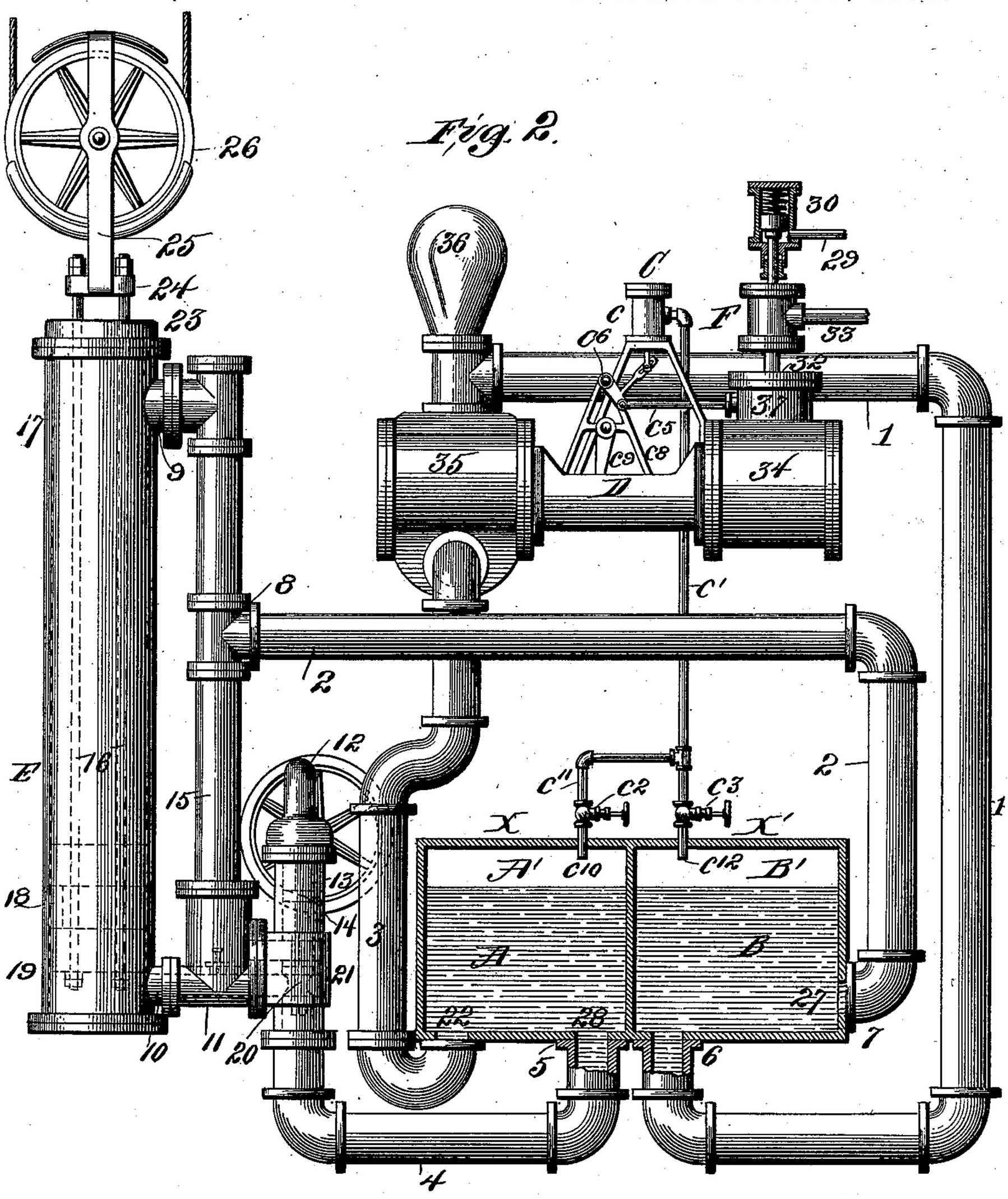
(No Model.) 2 Sheets—Sheet 2.

J. R. WADE.

HYDRAULIC ELEVATOR.

No. 528,281. Patented Oct. 30, 1894.

Fig. 2.



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UNITED STATES PATENT OFFICE.

JAMES R. WADE, OF ST. LOUIS, MISSOURI.

HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 528,281, dated October 30, 1894.

Application filed August 8, 1892. Serial No. 442,406. (No model.)

To all whom it may concern:

Be it known that I, JAMES R. WADE, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Hydraulic Elevators, of which the following is a specification.

The object of my invention is to provide improved means for maintaining a uniform pressure in the tanks and economizing the power necessary to operate the elevator.

The invention consists in certain novel features of the device illustrated in the accompanying drawings as will be hereinafter described and claimed.

In the drawings just referred to, Figure 1 is a view, partly in side elevation and partly in section, showing the hoisting cylinder, the pump and accompanying apparatus and embodying my invention. Fig. 2 is a similar view showing a slight modification.

My improvements are illustrated in connection with the well-known "Hale" elevator in which the hoisting cylinder is kept full of water at all times. When the elevator car is ascending, the piston is being driven downward by the pressure of the water above the same and the water below the piston is being forced out into the discharge or receiving tank. When the car is descending, the water in the cylinder is passing from above the piston to the space below the same and no discharge takes place. When it is desired to have the elevator car descend, the operating valve is shifted so as to shut off the supply of water from the top of the piston and close the passage to the discharge or receiving tank. This shifting of the valve simultaneously opens a by-pass port between the ends of the cylinder and allows the water which is above the piston to circulate through the circulating pipe and the by-pass port to the bottom of the cylinder. This operation is performed simply by the weight of the car and the load thereon, the car being sufficiently heavy to drop by gravity and cause the described circulation of the water as soon as the operating valve has been shifted.

In my device, the open discharge tank is dispensed with and the water is discharged into and drawn from air-tight compartments in which it is held under pressure. These compartments may be independent tanks or independent compartments in a single tank, as shown in Figs. 1 and 2 respectively. In connection with these compartments or tanks, I employ a pump which receives water from the discharge tank and forces it into the supply tank.

Referring particularly to the drawings by letters and numerals, E represents the elevator cylinder with the circulating pipe 15—8 and the valve chamber 14—21 attached.

17, 18 and 19 denote the piston within the elevator hoisting cylinder, 16 the rods rising therefrom and 25, 26 the usual sheave and standard.

From the valve chamber, a pipe 4—5 passes to the receiving compartment X which is air and water tight, and the circulating pipe communicates through a pipe 2—7 with the supply compartment X′ which is similar to the compartment X. Situated between the two compartments is a steam pump D which draws water from the discharge compartment X through the pipe 3 and forces it through the pipe 1—6 into the supply compartment. From the supply tank the water passes into the hoisting cylinder through the pipe 2—7, the circulating pipe and the port 9. The water thus passing into the upper end of the cylinder forces the piston downward and expels the water below the piston through the port 11, the valve chamber and the pipe 4—5 into the discharge tank. This circulation takes place only when the piston is descending and the car ascending, in which case the valve 20 is raised. The quantities of water in the two compartments are thus kept equal and a complete circulation through the several parts maintained by the action of the steam pump. In order to overcome the back pressure due to the load on the car, I follow the common practice of having the steam cylinders of the pump larger than the water cylinders.

In connection with the steam pump D, I employ an air pump C which is operated thereby and forces air into both the discharge and the supply compartments so as to maintain the desired pressure therein and thereby overcome the shock incident to the stoppage of the water circulation. The air pump communicates with the compartments through

the pipes c' c'' provided with valves c^2 c^3 so that the supply of air to either or both compartments may be cut off at will.

F designates a pump governor attached to the steam chest of the pump D. This pump governor may be of any well-known construction. An air cylinder 30 is formed integral with the pump governor and communicates therewith and a pipe 29 leads from this cylinder to the air space in the supply compartment. Should the pump continue to run and operate when the elevator is at rest, the pressure in the supply tank would be increased and the pressure in the discharge decreased. The excess of air would then pass through the pipe 29 into the cylinder 30 and lift the piston therein so as to close the steam valve of the pump governor and thereby stop the pump.

The air pump, it will be noticed, is situated between the two cylinders of the pump D, its piston c^7 being connected with the rock arm shaft c^6 of the valve mechanism of the pump D so that it makes one full stroke with each full stroke of the said pump D. The exact arrangement of the air pump, however, is immaterial.

When the elevator car is descending, the pump is at rest as hereinbefore described, the weight of the car being sufficient to overcome the equilibrium of pressure in the cylinder and other parts. In order to raise the car, it is necessary only to pump the water into the cylinder above the piston and as the said piston is the only direct resistance offered to the water when the operating valve is opened, the piston must travel if the pump be operated. In my device, therefore, the power required varies directly as the load to be raised and the consumption of fuel is likewise varied and a saving of the same effected. In the prior systems it requires as much power to lift the empty car as it does to lift a full car load of passengers as it required the same volume of water under pressure, in either case the pressure stored up being lost when the water was discharged from pressure above the atmosphere to atmospheric pressure, the loss being in proportion to the difference between the two pressures. In the old system the tanks, sometimes one, sometimes both, are exposed to the atmospheric pressure, while I close both tanks and maintain the water in both under constant pressure. The difference between the pressures in the tanks, if there be any, will be due entirely to the load on the elevator car which offers resistance but one way and is overcome by the pump. The pressure being once accumulated is constantly maintained and consequently an absolutely smooth running of the elevator is insured and the same water is used over and over again.

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

1. In a hydraulic elevator, the combination with the hoisting cylinder, of air-tight discharge and supply compartments, pipe connections between the cylinder and said compartments, a steam pump connected with said compartments and forcing the water from the discharge compartment into the supply compartment, and an air pump with which both compartments are connected so as to be in constant communication and under the same air pressure.

2. In a hydraulic elevator, the combination with the hoisting cylinder, of air-tight discharge and supply compartments, pipe connections between the cylinder and said compartments, a steam pump connected with said compartments and forcing the water from the discharge compartment into the supply compartment, an air pump connected with both compartments and operated by the steam pump to force air into the compartments, the compartments being so connected with the air pump as to be in constant communication and under the same air pressure, a pump governor on the steam pump, an air cylinder connected with said governor, and an air pipe leading from the supply compartment to said air cylinder whereby in the event of an excess of pressure in the supply compartment the pump will be stopped.

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Witnesses:
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