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HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 459,209, dated September 8, 1891.

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To all whom it may concern:

Be it known that I, JOHN G. STAMP, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Hydraulic Elevators, of which the following is a specification.

This invention relates to the pumping apparatus which is employed in connection with hydraulic elevators for supplying water under pressure to the cylinder, whereby the system of pulleys and lifting-cables of the elevator-car are actuated. The compressed air escapes in small quantities with the water discharged from the pressure-chamber containing the compressed air and water, so that in time the volume of compressed air becomes so small that its expansive force is insufficient to operate the elevator. In order to discharge the excess of water and permit the proper volume of air to be restored to the pressure-chamber, it has been customary to run the elevator-car up and down empty; but this requires considerable time and causes delays. It has hitherto been sought to overcome this difficulty by connecting an air-pipe with the suction-chamber of the pump, so as to mix the water with the air before its delivery into the pressure-chamber, and thus replace the loss of air; but unless the air supplied to the pump is properly regulated the volume of air so drawn into the pump-cylinder will be excessive, in which case the air acts as a cushion, which impairs the action of the pump and sometimes requires the pump to be stopped to allow the air to escape, causing annoying interruptions of the elevator service.

The object of my invention is to so organize the pumping apparatus that when the volume of compressed air in the pressure-chamber becomes deficient from any cause the proper quantity of air may be readily restored without regulating the water-supply to the pump or requiring the elevator to be run empty to discharge the surplus water from the pressure-chamber.

In the accompanying drawings, Figure 1 represents a sectional elevation of a hydraulic elevator plant embodying my improvement.

Fig. 2 is a vertical section of the air-injector on an enlarged scale. Fig. 3 is a cross-section in line *xx*, Fig. 2.

Like letters of reference refer to like parts in the several figures.

A represents the closed pressure-chamber containing water and compressed air, and A' is the pipe whereby the water is delivered under pressure from the chamber A to the usual actuating-cylinder of the chamber. This actuating-cylinder and the system of pulleys and lifting-cables operated by the same are not shown in the drawings, and may be of any ordinary construction.

B is the pump, and *b* the pipe, through which water is delivered by the pump into the lower portion of the pressure-chamber A.

C is an open water-tank, from which the pump draws its supply through the suction-pipe D. The latter may be provided with a valve *d* for shutting off the supply of water to the pump for making repairs or for other purposes.

E is an auxiliary pipe leading from the pressure-tank A to the suction-pipe D. This auxiliary pipe enters the pressure-chamber below the water-level, and is provided with a cut-off valve *e*.

F is an air-injector connected with the auxiliary pipe E, and whereby air is commingled with the water flowing through said pipe. This air-injector consists, preferably, of a pipe *f*, which enters a shell or casing *e'*, arranged in the auxiliary pipe E, and extends downwardly a short distance into the upright portion of the latter, the pipe *f* being separated from the surrounding water-pipe by an annular space, through which the water passes. The injector-pipe *f* is provided with a depending branch *f'*, having a valve *f*² for regulating the quantity of air admitted to the injector. Upon opening the valve *e* of the auxiliary pipe E and the valve *f*² of the injector the water passes through the pipe E into the supply-pipe of the pump, producing a vacuum at the mouth of the injector-pipe *f'*, whereby air is drawn into the auxiliary pipe and mixed with the water supplied to the pump. A perforated diaphragm *f*³ is preferably arranged in the pipe E at the mouth of

the injector-pipe *f* to restrict the passage of the water at this point and increase the force of the suction.

In the ordinary operation of the apparatus
5 the valve of the suction-pipe *b* is wide open and the valves of the injector-pipe *f'* and the auxiliary pipe *E* are closed, so that the water in the pressure-chamber *A* is shut off from the pipe *E* and the injector rendered
10 inoperative. When the volume of air in the pressure-chamber becomes deficient, the valve of the auxiliary pipe *E* and the regulating-valve of the injector-pipe are opened. A portion of the water in the pressure-chamber is now forced into the pipe *E* and in its
15 passage through the same is mixed with air. The water charged with air is delivered into the suction-pipe *D* of the pump and forced by the latter into the pressure-chamber,
20 whereby the volume of air in the latter is increased, the air rising above the surface of the water into the air-space in the upper part of the chamber. As the water for operating the air-injector is drawn from the pressure-
25 chamber, the latter is gradually relieved of its surplus water, and the water so discharged is replaced by the air and partly by the water forced into the chamber. When the proper proportion of water and air is established in
30 the pressure-chamber, the valves of the auxiliary pipe *E* and injector *F* are closed. The proper volume of air is thus readily restored in the pressure-chamber, when necessary, without requiring the elevator to be run up
35 and down numerous times, and as the flow of the water to the pump is unrestricted the

pump always has a sufficient supply to prevent air from being delivered into the pump in such large quantities as to cushion the pump and impair its action.

It is obvious that any other suitable air-injecting device may be employed instead of that described and shown.

I claim as my invention—

1. In a hydraulic elevator, the combination, with a pressure-chamber containing air and water and a pump for delivering water to said chamber, of a suction-pipe connecting the pump with the source of supply, an auxiliary pipe leading from the pressure-cylinder to said suction-pipe, and an air-injector arranged in said auxiliary pipe, whereby the water in the latter is mixed with air, substantially as set forth.

2. In a hydraulic elevator, the combination, with a pressure-chamber containing air and water and a pump having its delivery-pipe connected with the pressure-chamber, of a suction-pipe connecting the pump with the source of supply, an auxiliary pipe connecting said suction-pipe with the pressure-cylinder and having a cut-off valve, and an air-injector arranged in said auxiliary pipe and provided with a valve for regulating the supply of air to the injector, substantially as set forth.

Witness my hand this 15th day of June, 1891.

JOHN G. STAMP.

Witnesses:

C. F. GEYER,

FRED. C. GEYER.