(No Model.)

2 Sheets—Sheet 1.

J. G. STAMP.

HYDRAULIC ELEVATOR.

No. 518,377. Patented Apr. 17, 1894.

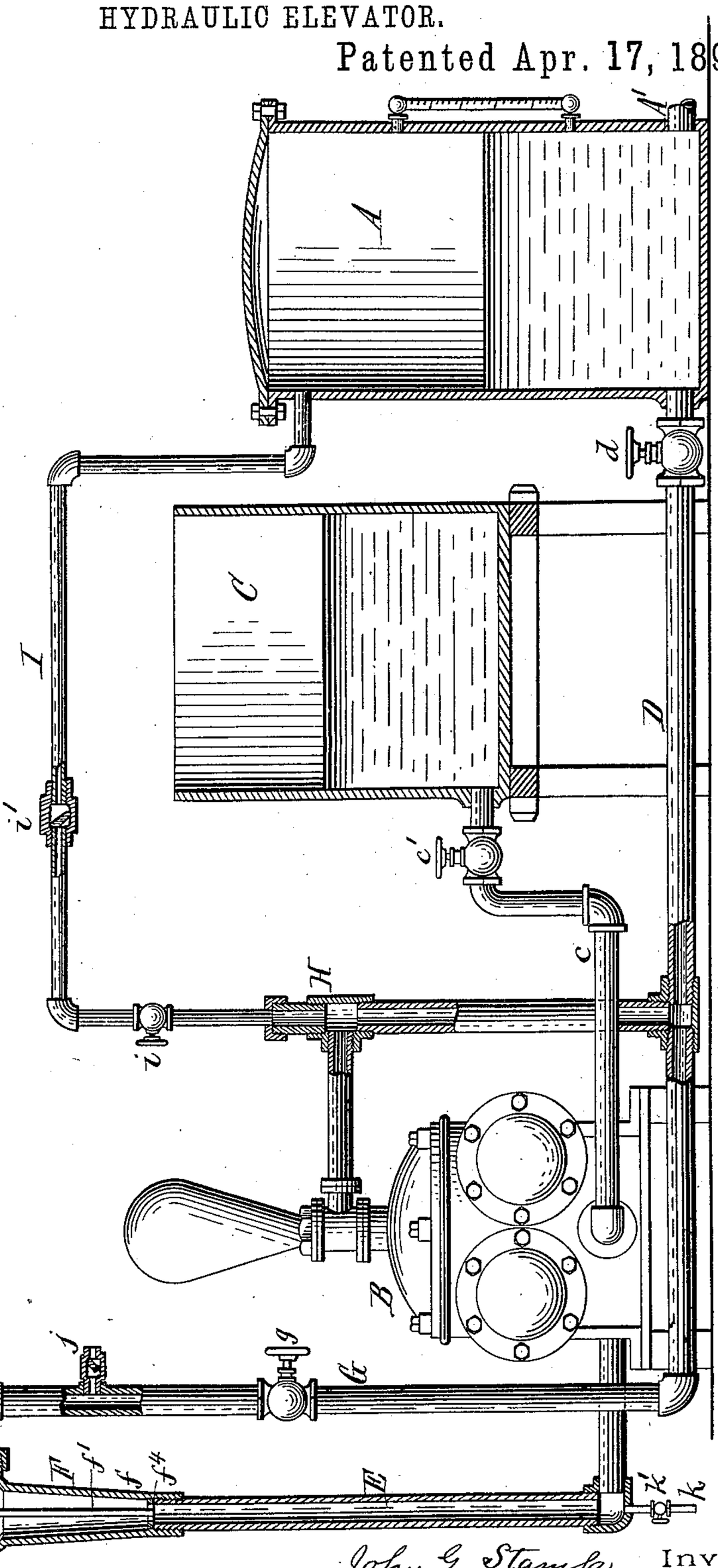

Fig. 1.

Witnesses:
T. Gustav. Wilhelm.
Chas. F. Burkhardt.

John G. Stamp Inventor.
By Wilhelm & Bonner
Attorneys

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2

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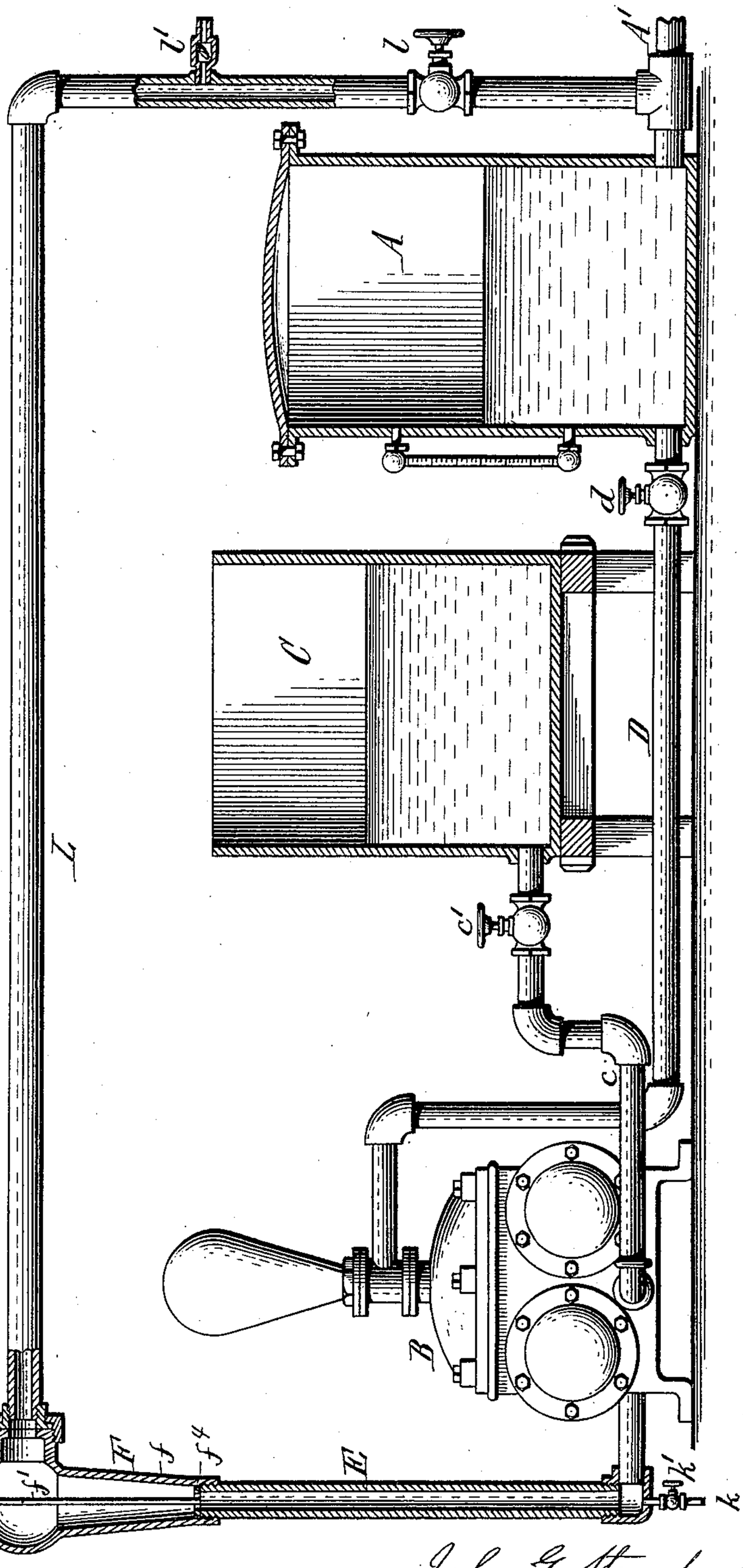

Fig. 2.

WITNESSES:
Chas. F. Burkhardt.
F. Lynter Wilhelm

John G. Stamp INVENTOR.
By Wilhelm & Bonner
ATTORNEYS.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN G. STAMP, OF BUFFALO, NEW YORK.

HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 518,377, dated April 17, 1894.

Application filed May 11, 1893. Serial No. 473,796. (No model.)

To all whom it may concern:

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

This invention relates to the pumping apparatus employed in connection with hydraulic elevators for supplying water under pressure to the cylinder which actuates the system of pulleys and lifting cables of the elevator car. 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 insufficient to operate the elevator.

For the purpose of restoring the proper volume of air in the pressure chamber, the apparatus is provided with an air injector by which external air is introduced into the water drawn into the pump, as described in Letters Patent No. 459,209, granted to me September 8, 1891.

One object of my present invention is to deliver the aerated water to the pump as directly as possible, so that the aerated water is kept separate from the ordinary water supply drawn to the pump, whereby the air and water are kept commingled while passing through the pump, thereby preventing cushioning, and whereby waste of air by its escape backward through the ordinary water supply is avoided.

Another object of my invention is to provide means whereby the air is permitted to separate from the water in the delivery pipe of the pump and is conducted by a separate pipe to the air space of the pressure chamber.

Another object of my invention is to prevent the pounding of the water in the water pipe leading to the air injector.

In the accompanying drawings consisting of two sheets:—Figure 1 is a sectional elevation of a hydraulic elevator plant containing my improvement. Fig. 2 is a similar view of a modified construction of the apparatus.

Like letters of reference refer to like parts in both figures.

A is the usual closed pressure tank or chamber containing water and compressed air, and A′ is the discharge pipe thereof through which the water is delivered under pressure to the usual actuating cylinder. This actuating cylinder and the system of pulleys and lifting cables operated from the reciprocating piston of this cylinder are not shown in the drawings and may be of any well known or approved construction.

B is the pump, of common construction, and C is an open water tank from which the pump is supplied by the suction pipe *c*, which latter is provided with a valve *c′* for shutting off the supply of water to the pump, for making repairs or other purposes.

D is the delivery pipe of the pump which leads from the latter to the lower portion of the pressure chamber A and which is provided with the usual hand valve *d*.

E is an air and water mixing pipe connected at its lower end directly with the suction chamber of the pump, and F is an air injector connected with said pipe, preferably the upper portion thereof, as shown.

G is a water pipe which connects the air injector with the delivery pipe D of the pump, and which is provided with a hand valve *g* for controlling the passage of the water through the same. The air injector F consists preferably of a spherical casing having a downwardly-tapering extension or nozzle *f*, and an air pipe *f′* entering said casing and terminating in the lower portion of its tapering extension, the pipe being separated from the surrounding wall of the casing by an annular space or passage through which the water passes. The outer end of this air pipe opens into the atmosphere and its inner end into the casing. An inwardly-opening check valve f^2 is applied to the outer branch of this pipe. The upper end of the mixing pipe E is connected to the tapering extension *f* of the injector casing by a screw threaded connection, while the upper end of the water pipe G is connected with a lateral nozzle f^3 of the casing. The water passing from the pipe G through the injector casing, produces a vacuum at the mouth of the air pipe *f′*, whereby air is drawn into the casing and commingled with the water flowing through the same. A perforated diaphragm f^4 is preferably arranged in the injector casing around the mouth of the air pipe *f′*, to restrict the pas-

sage of the water at this point and increase the force of the suction.

H represents an air separating chamber connected with the pump delivery pipe D preferably adjacent to the pump, and I is an air pipe leading from said separating chamber to the upper portion of the pressure chamber A. This air pipe is furnished with a hand valve *i*, and between said hand valve and the pressure chamber with a check valve *i'*, whereby the return of the compressed air into the separating chamber H is checked.

j is a check valve which is arranged in the water pipe G, between its hand valve *g* and the air injector and which opens inwardly, so as to permit air to be drawn into the water pipe G, but prevents the escape of water or air therefrom. When the hand valve of this water pipe is closed, the water contained in the upper portions of the pipes G and E, tends to move back and forth by the action of the pump, producing a disagreeable pounding noise. The check valve allows air to enter in the pipe G, and this allows the water in the pipe G above the valve *j*, and in the pipe E to drain down in the pipe E to the level of the water in the open tank C. This relieves the upper portions of these pipes from water and prevents the pounding resulting therefrom.

k is a drain pipe connected with the mixing pipe E adjacent to the pump, and having a stop cock *k'*.

In the ordinary operation of the apparatus, the hand valves of the suction pipe *c* and the delivery pipe D are open and those of the water pipe G, and the air supply pipe I are closed. When the volume of air in the pressure chamber becomes deficient and it is desired to restore the proper amount to the same, the valves of the water pipe G, and the air supply pipe I are opened. A portion of the water passing through the delivery pipe D is now forced through the water pipe G, into and through the air injector F and from the latter through the mixing pipe E, into the suction chamber of the pump, whence it is passed through the pump and again caused to make the same circuit. In its passage through the injector casing, the water is mixed with the air drawn through the air pipe *f'*, and the water so charged with air is delivered directly into the suction chamber of the pump and forced by the latter into the delivery pipe D. Upon arriving in the separating chamber H, the air becomes separated from the water and is forced through the supply pipe I into the pressure chamber A, while the water continues its course through the delivery pipe and the water pipe G, passing again through the air injector and the pipe E and becoming again charged with air. The volume of air in the pressure chamber is thus gradually increased by the air delivered into it through the supply pipe I. When the proper volume is supplied to the pressure chamber, the valves of the water pipe G, and the air supply pipe I are closed, when the apparatus operates in the ordinary manner. By delivering the water charged with air directly into the suction chamber of the pump, the air remains intimately mixed with the water during its passage through the pump and does not become separated therefrom until it leaves the pump, thereby avoiding the liability of cushioning the pump and insuring an uninterrupted operation of the elevator. When the water is drawn from the pressure tank through the injector to the pump, the latter does not return as much water to the pressure tank as is drawn off, and the surplus of water which the pump does not return to the pressure tank, passes off through the suction pipe into the open tank. In the construction shown in my former patent referred to where the connection of the injector pipe is made with the suction pipe of the pump, the current of aerated water entering the suction pipe from the injector pipe is divided, part of it going to the pump, and the surplus to the open tank. This surplus carries with it the air which is contained in it and this air escapes from the open tank and is lost. In the present construction, in which the injector pipe is connected with the suction chamber of the pump, underneath the suction valves, the suction chamber forms a separating chamber or expansion chamber which causes the air in the water to separate from the water and rise up to the valves, so that it can be taken by the pump, while the surplus water alone, which has been so deprived of its air, can escape downwardly and flow back through the suction pipe to the open tank. In other words, the aerated water being thrown into the suction chamber, parts with its air there, all the air rising by its buoyancy to the valves and passing to the pump, and only the surplus of water deprived of its air flows back to the open tank, and as that water carries no air with it there is no air lost. The requisite volume of air can therefore be supplied to the pressure chamber in a short time without the necessity of running the elevator up and down empty numerous times, as has been a common practice, or otherwise interrupting the elevator service.

In the modified arrangement of the apparatus shown in Fig. 2, the air supply pipe I, separating chamber H, and the water pipe G of the first described apparatus are omitted and the latter pipe is replaced by a water pipe L which extends from the discharge pipe A' of the pressure chamber to the air injector. The water pipe L is provided with a hand valve *l* and a check valve *l'*, corresponding in function to the valves *g* and *j* of the water pipe G. In this apparatus, when it is desired to supply air to the pressure chamber, the hand valve of the water pipe L is opened. A portion of the water discharged from the pressure chamber now passes through the water pipe L into and through the air in-

jector, thus drawing air into the injector casing and mixing the same with the water, which latter, charged with air, passes through the mixing pipe E into and through the pump, whence it is delivered into the pressure chamber through the delivery pipe D. In the pressure chamber, the air becomes separated from the water, and thus increases the volume of air in the chamber. A portion of the water again circulates through the pipe L, the air injector and the pump and takes up more air and this operation continues so long as the hand valve of the pipe L remains open. When the proper amount of air is delivered into the pressure chamber, the valve of the pipe L is closed.

This modified construction of the apparatus may be employed in cases where it is inconvenient or undesirable to connect additional pipes to the pressure chamber.

I claim as my invention—

1. In a hydraulic elevator, the combination with the pressure chamber, a pump for delivering water to said chamber, and a suction pipe connecting the pump with the source of supply, of a water and air mixing pipe provided with an air injector and connected with the suction chamber of the pump independent of the suction pipe thereof, substantially as set forth.

2. In a hydraulic elevator, the combination with a pressure chamber, a pump having its delivery pipe connected with said chamber and a suction pipe connecting the pump with the source of supply, of a water and air mixing pipe connected directly with the suction chamber of the pump, an air injector connected with said mixing pipe, a water pipe connecting said air injector with the delivery pipe of the pump, and an air supply pipe connected with said delivery pipe, between the pump and the junction of said water pipe with the delivery pipe, and leading to the pressure chamber, substantially as set forth.

3. In a hydraulic elevator, the combination with a pressure chamber, a pump having its delivery pipe connected with said chamber and a suction pipe connecting the pump with a source of supply, of a water and air mixing pipe connected directly with the suction chamber of the pump, an air injector connected with said mixing pipe, a water pipe connecting said air injector with the delivery pipe of the pump, a separating chamber connected with the delivery pipe between the pump and the junction of said water pipe with the delivery pipe, and an air supply pipe extending from said separating chamber to said pressure chamber, substantially as set forth.

4. In a hydraulic elevator, the combination with a pressure chamber, a pump having its delivery pipe connected with said chamber and a suction pipe connecting the pump with a source of supply, of a water and air mixing pipe connected with the suction chamber of the pump, an air injector connected with said mixing pipe, a water pipe connecting said air injector with the delivery pipe of the pump, and having a hand valve and a check valve, and an air supply pipe connecting the delivery pipe of the pump with the pressure chamber, substantially as set forth.

Witness my hand this 6th day of May, 1893.

JOHN G. STAMP.

Witnesses:

CARL F. GEYER,

THOMAS H. STAMP.