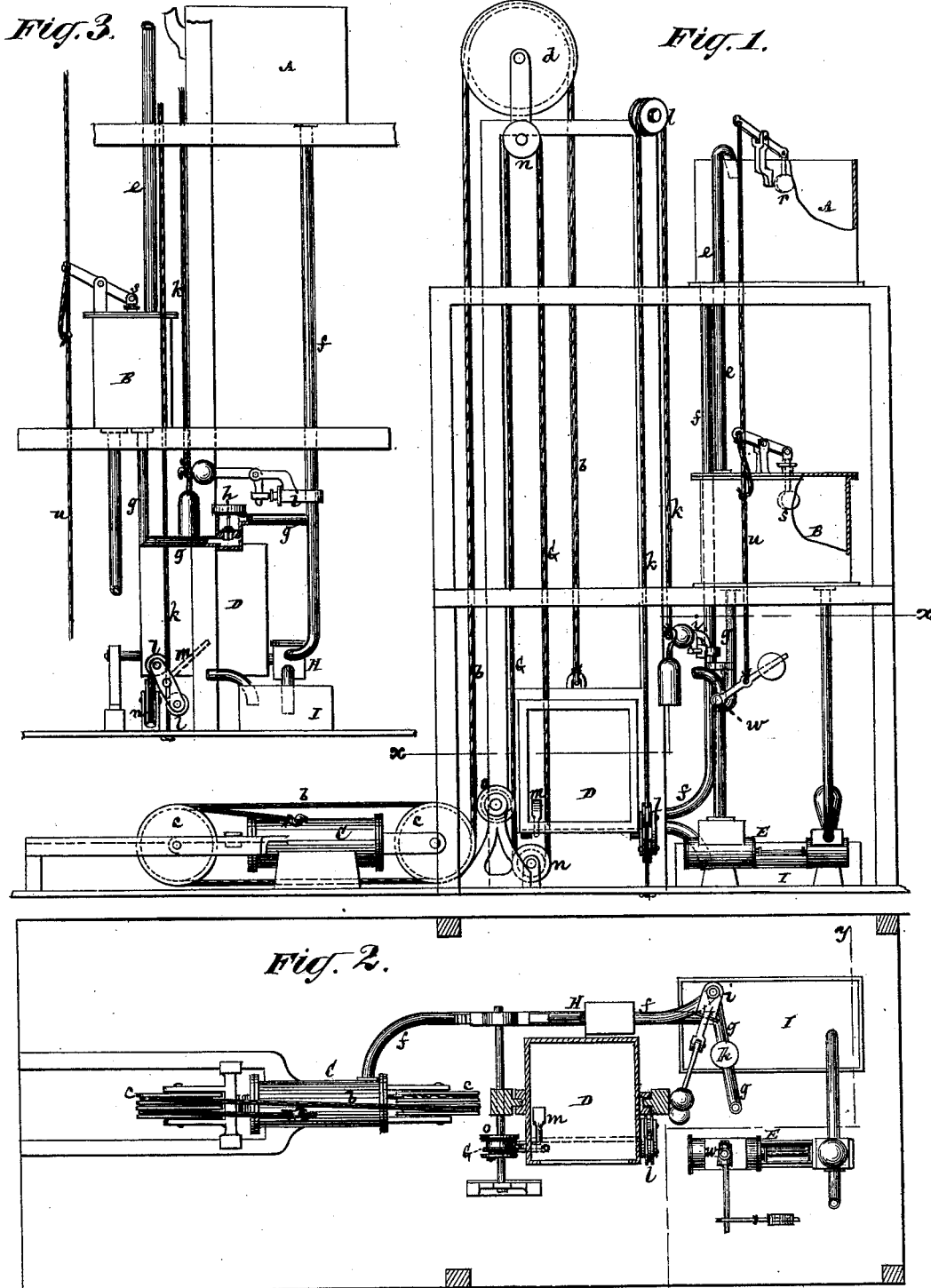


C. R. OTIS.  
Hydraulic-Elevator.

No. 205,895.

Patented July 9, 1878.



Witnesses  
John Becker.  
& Allen

Inventor - Charles R. Otis. By Brown - Allen  
Attys.

# UNITED STATES PATENT OFFICE.

CHARLES R. OTIS, OF YONKERS, NEW YORK.

## IMPROVEMENT IN HYDRAULIC ELEVATORS.

Specification forming part of Letters Patent No. 205,895, dated July 9, 1878; application filed January 12, 1878.

### *To all whom it may concern:*

Be it known that I, CHARLES R. OTIS, of Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Hydraulic Elevators, of which the following is a description, reference being had to the accompanying drawing, forming part of this specification.

This invention more particularly relates to hydraulic elevators in which supply-tanks, arranged at different altitudes, are used; and the invention generally consists in certain novel combinations of devices, whereby, while an intermediate or lower head or pressure may be employed for lighter loads or the ordinary work of the elevator, a temporary increased pressure is obtained in starting the load, and the pressure may be increased at pleasure for lifting heavier loads by drawing water from an upper tank without its passage through the under tank, substantially as hereinafter described.

Figure 1 represents a side elevation of a hydraulic elevator constructed in accordance with my invention. Fig. 2 is a horizontal section of the same on the irregular line *x x*; and Fig. 3 is a sectional elevation thereof, in part, mainly on the irregular line *y y*.

A is an upper tank, which may be placed at the top of the building containing the elevator or hoisting apparatus, and which may be left open at its top. B is an additional tank, arranged to occupy an intermediate position or altitude, which may be midway between the upper tank A and the motor C, which actuates the car D by means of a rope or chain, *b*, and pulleys *c c d*. This intermediate tank B is closed at its top and made capable of sustaining a superincumbent pressure, due to a column of water in a pipe, *e*, connecting the tank A with the intermediate tank B.

Ordinarily the upper tank A would be filled with water by this pipe *e* from the intermediate tank B, so that after starting a steam-pump, E, this last-named tank B will first be filled, and surplus water pumped into said tank be forced up the pipe *e*, and allowed to run over the top of and into the upper tank A to fill the latter; but when using the water in the upper tank A to operate or assist the motor C, as hereinafter more particularly re-

ferred to, said water in its descent to the motor does not pass through the intermediate tank B, but is conveyed by a separate supply-pipe, *f*, directly from the bottom of the tank A to the motor.

Another pipe, *g*, connects the bottom of the intermediate tank B with the motor supply-pipe *f* at a point in the latter which is at or below the level of the bottom of said tank. This pipe or connection *g* is fitted with a check-valve, *h*, which prevents water from the upper tank passing to the intermediate tank.

The supply-pipe *f* is provided above the pipe or connection *g* with a stop-cock or valve, *i*, which is preferably self-closing, and which is connected, by means of a rod, rope, or chain, *k*, and pulleys *l*, or other suitable contrivances, with a treadle or hand mechanism, *m*, within reach of the operator in the car, so that said valve *i* may be opened by the operator whenever it is required to bring into use the superior pressure of the water as derived from the upper tank A, as, for instance, in lifting a heavy load. At all other times, however, this valve *i* in the pipe *f* leading to the upper tank A will remain closed, thus leaving the water in the intermediate tank B to act as the main source of supply in working the elevator or its car for ordinary or light loads.

G is the usual main hand-rope, by which the action of the motor to control the motion of the car is controlled, said rope passing over or around pulleys *n n o*, and serving, by suitable mechanical devices, to control a valve, H, in the supply-pipe *f*, which valve is arranged below the intermediate tank B. So long as the operator makes use of this main hand-rope G the water to operate the motor will be drawn exclusively from the intermediate tank B, subject only, when the pump E is in operation and water is passing to the upper tank, to the additional pressure of the column of water in the pipe *e*; but the quantity of water in this pipe will soon be exhausted, and only exerts an additional force in starting the car to overcome the inertia of the apparatus, the pipe *e*, by its delivery end, terminating in the upper portion of the tank A, not drawing water from said tank A. This connecting pressure or supply pipe *e* between the two tanks A and B is consequently a valuable adjunct to the apparatus when starting

the car; but after the latter has been fairly started, the draft to supply the motor is taken from the lower tank B.

When it is required to lift a heavier load than the water in the tank B by its restricted altitude is capable of accomplishing, then the operator, by means of the rod, rope, or chain *k*, opens the valve *i*, and thereby causes the draft of water to supply the motor to be taken from the upper tank A.

The economy of thus working the elevator will be obvious from the fact that the cost of pumping water depends upon the height to which it is raised. For all ordinary loads the supply will be drawn from the intermediate tank B, which, if placed midway between the pump and the upper tank, is supplied or kept filled with water at one-half the cost of supplying the upper tank, while for starting the elevator, when more power is required than to keep it in motion after having been started, a temporary higher head of water, due to the column in the pipe *e* connecting the intermediate tank with the top of the upper tank, is obtained.

This invention accordingly differs from other hydraulic elevators in which tanks placed at different altitudes have been used, and when requiring to use a much heavier continuous pressure than is derivable from the intermediate tank, the water, in being drawn from the upper tank by opening the valve *i*, does not pass through the intermediate tank to the motor, but directly to the latter, so that the intermediate tank may be kept charged with water for subsequently lifting a lighter load, or for the ordinary work of the elevator.

I is a waste-water vessel or chamber for receiving the spent water from the motor, and serving also as a reservoir for resupplying the tanks A and B, thus using the same water over and over again. Both of these tanks A and B should or may be provided with floats *r s* in independent connection with a rope, *u*, for automatically controlling the inlet-valve *u* of the steam-pump E to keep said tanks filled with water, and for stopping the pump when both tanks are fully charged. These last-named devices, however, form no part of this invention.

Instead of running the supply-pipe *e* to the top of the upper tank A, it may be connected to the bottom of said tank without changing the general operation hereinbefore described by simply placing a check-valve in said pipe where it connects to the tank, to prevent the water, by the closing of said valve, from passing to the lower tank from the upper one, an air-

valve opening inward also being attached to the pipe *e*, immediately below the upper tank, to prevent the formation of a vacuum in said pipe when drawing out water through the lower tank. Such modification, however, which involves the use of special valves, is less simple than the one hereinbefore described, and reduces the height of the column in the pipe *e*, available as an auxiliary starting force, to a degree or extent which is equal to the depth or height of the upper tank A.

Furthermore, in the invention which I have here described a leading characteristic is the combination of the closed tank B, the open tank A, and the motor C; and another prominent feature of the invention is the combination of the closed tank B and the motor C with the pipe *e*, operating to give a temporary increased pressure when starting the elevator.

I claim—

1. The combination of the closed tank B and the open tank A with the motor C, substantially as specified.

2. The combination of the closed tank B and the motor C with the water-pipe *e*, whereby a temporary increased pressure is obtained when starting the elevator, essentially as described.

3. In a hydraulic elevator having supply-tanks arranged at different altitudes, the combination, with the supply pipe or pipes to the motor from said tanks, of an independent connecting pressure or supply pipe, *e*, between the upper portion of the upper tank and the intermediate or lower tank, substantially as and for the purpose or purposes herein set forth.

4. The combination, with the upper tank A and lower or intermediate tank B, of the supply-pipe *f*, connecting the motor of the elevator with the upper tank A, the pipe *g*, connecting the intermediate tank with the pipe *f*, a check-valve, *h*, applied to said pipe *g*, and a valve, *i*, arranged to intercept the water in the pipe *f* above the pipe *g*, and made capable of control by the operator, essentially as described.

5. The combination of the independent connecting pressure and supply pipe *e* with the upper and lower tanks A B, the supply-pipe *f* to the motor from the upper tank, the valve *i* in said pipe *f*, subject to control by the operator, and the pipe *g*, provided with a check-valve, *h*, and connecting the pipe *f* below the valve *i* with the lower tank B, substantially as specified.

CHAS. R. OTIS.

Witnesses:

FRED. HAYNES,  
VERNON H. HARRIS.