

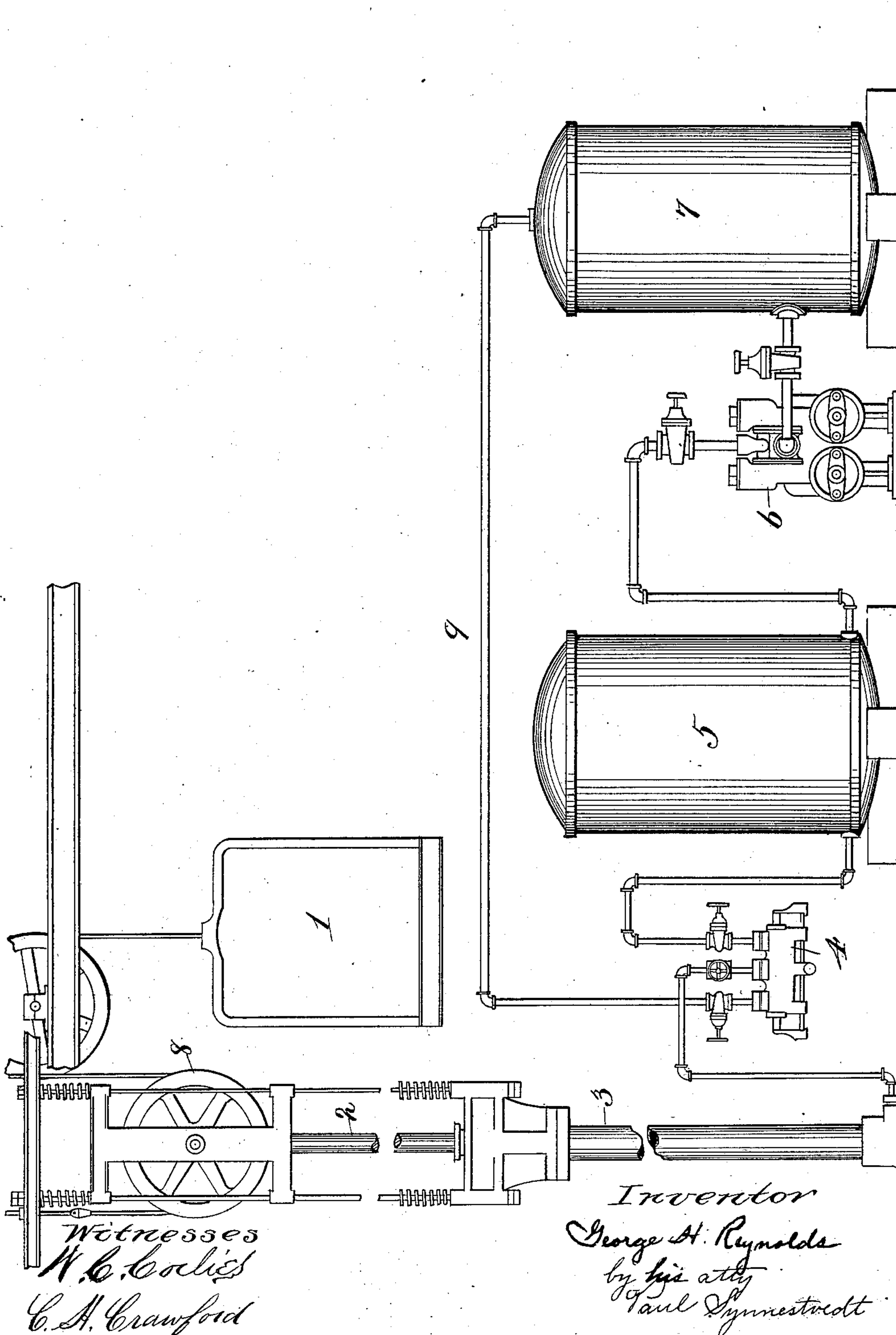
No. 661,587.

Patented Nov. 13, 1900.

G. H. REYNOLDS.
HYDRAULIC ELEVATOR.

(Application filed July 24, 1896.)

(No Model.)



UNITED STATES PATENT OFFICE.

GEORGE H. REYNOLDS, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE OTIS ELEVATOR COMPANY, OF EAST ORANGE, NEW JERSEY.

HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 661,587, dated November 13, 1900.

Application filed July 24, 1896. Serial No. 600,456. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. REYNOLDS, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Hydraulic Elevators, of which the following, taken in connection with the accompanying drawing, is a specification.

This invention is applicable to any kind of elevator of the class specified, but will be herein shown and described in connection with an elevator of the type in which a weighted ram is used for raising the car.

One object of this invention is the recovery or storage for reuse of a substantial portion of the energy or force employed in operating the car. A further object is to dispense with the use of counterbalance-weights, such as are employed on horizontal machines, and substitute therefor the resistance of a closed tank against the pressure of which the water from the cylinder is discharged.

To the accomplishment of these and such other objects as may hereinafter appear my invention consists in the combination, with a pump, pressure-tank, and vertical cylinder having a weighted ram therein, of a closed storage-tank containing fluid under pressure and connected with such cylinder and pump.

To enable others skilled in the art to more clearly understand the nature of my improvements, I will now proceed to describe the same in connection with the accompanying drawing, in which—

1 represents an elevator-car, 2 the ram for operating the car, and 3 the cylinder in which the ram works. Controlling the supply and exhaust ports to the cylinder I provide a valve of usual construction, (marked 4.) The supply-pipe to this valve comes from a tank 5, containing water under pressure, which in turn is supplied by a pump 6, which may be of any preferred form.

All the parts to which I have heretofore referred by reference-numbers are well known in the art and, constituting no part of my present invention, require no detailed description here.

In elevators employing the parts above described as heretofore commonly made the discharge-pipe, which carries the water away

from the cylinder, is arranged to empty into an open tank, to which is connected the suction-pipe of the pump. In the practice of my invention in place of this open tank I substitute a closed tank capable of withstanding a predetermined amount of pressure. Into this closed tank I connect the discharge-pipe from the operating-valve, and from a point at or near its lower end the suction from the pump is connected. Such a tank I have shown in the drawing and marked 7.

When the elevator is first started, water is pumped into the tank 5 until sufficient pressure is accumulated to operate the machine. This water is admitted through the controlling-valve 4 into the cylinder 3 and raises the weighted plunger to lower the car, and when it is desired to raise the car the operating-valve 4 is shifted to allow the water within the cylinder 3 to discharge. When the weighted ram descends, it carries with it the sheave 8, around which pass the hoisting-cables. It is obvious that with this arrangement it is necessary to at all times retain within the cylinder 3 a pressure sufficiently great to support the hydrostatic column within such cylinder, or a vacuum might be formed beneath the weighted ram 2 and cause violent and dangerous lurching of the car. The accumulation and maintenance of this hydrostatic column requires, of course, the expenditure of an amount of force equivalent to the weight of said column, and in elevators of this class as heretofore made this expenditure of force or energy has been wasted by the discharge of the water on the descent of the ram into an open tank.

I propose by providing a closed tank to receive the cylinder-exhaust to store in such tank the amount of pressure or force which was necessarily expended in accumulating and sustaining the aforesaid hydrostatic column and by connecting such storage-tank with the suction-pipe to the pump restoring to the parts the energy so expended.

In operation it is of course necessary that the pressure-tanks, as well as the storage-tanks, be first partly filled with water, while the remainder of the space is occupied by air under pressure, as it is the expansion of the compressed air which supplies the operative

force. The pressure in the storage-tank should in all cases be a little more than sufficient to maintain the necessary hydraulic head in the water in the cylinder which surrounds the ram.

The operation of my invention, as already described, serves to maintain the pressure in the storage-tank at a nearly-uniform degree, and the pressure so maintained is all recovered and utilized by the pump, to which the water is forced by such stored pressure whenever the pump is in operation. As a result the pressure so stored works with the pump to relieve it of work just in the proportion that the pressure in the storage-tank bears to the pressure in the pressure-tank. In other words, a substantial portion of the energy expended in operating the elevator-car is recovered and stored, so that it may be utilized for the double purpose of counterbalancing the hydrostatic column in the cylinder and reducing the power required to operate the pumps. This substitution of the resistance of the pressure in the storage-tanks in place of the cumbersome counterweights ordinarily used renders the car more manageable, in that it dispenses with the disturbing effect of the momentum of such heavy counterbalance-weights.

Having thus described my invention, I desire it to be understood that I do not claim herein the combination of a car, a ram operatively connected with so as to elevate the car, a closed cylinder in which the ram freely works, means for introducing a hydraulic lifting-column in the cylinder at its lower end for raising the ram, and means for con-

necting the hydraulic lifting-column with a hydrostatic-column, as such combination is claimed in my Patent No. 655,012, granted July 31, 1900; but

What I claim as new, and desire to secure by Letters Patent, is—

1. In a hydraulic elevator, a vertically-arranged operating-cylinder, a weighted ram arranged to operate therein and connected to the car in combination with a closed storage-tank arranged to receive the exhaust from said cylinder, a pressure-tank connected to said cylinder and forming the source of operating pressure therefor and a pump arranged to deliver the pressure from said storage-tank to said pressure-tank, whereby a portion of the pressure in said cylinder, developed by the excessive weight of the ram in descending is stored up and utilized in effecting the raising of the ram, as and for the purpose set forth.

2. In a hydraulic elevator, a vertically-arranged operating-cylinder, a weighted ram arranged to operate therein and connected to the car, a closed vertically-arranged storage-tank, a pipe delivering from the lower end of said cylinder into the upper end of said storage-tank, a pressure-tank delivering from the end thereof into the lower end of said cylinder, and a pump delivering from the lower end of said storage-tank into said pressure-tank, as and for the purpose set forth.

GEO. H. REYNOLDS.

Witnesses:

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