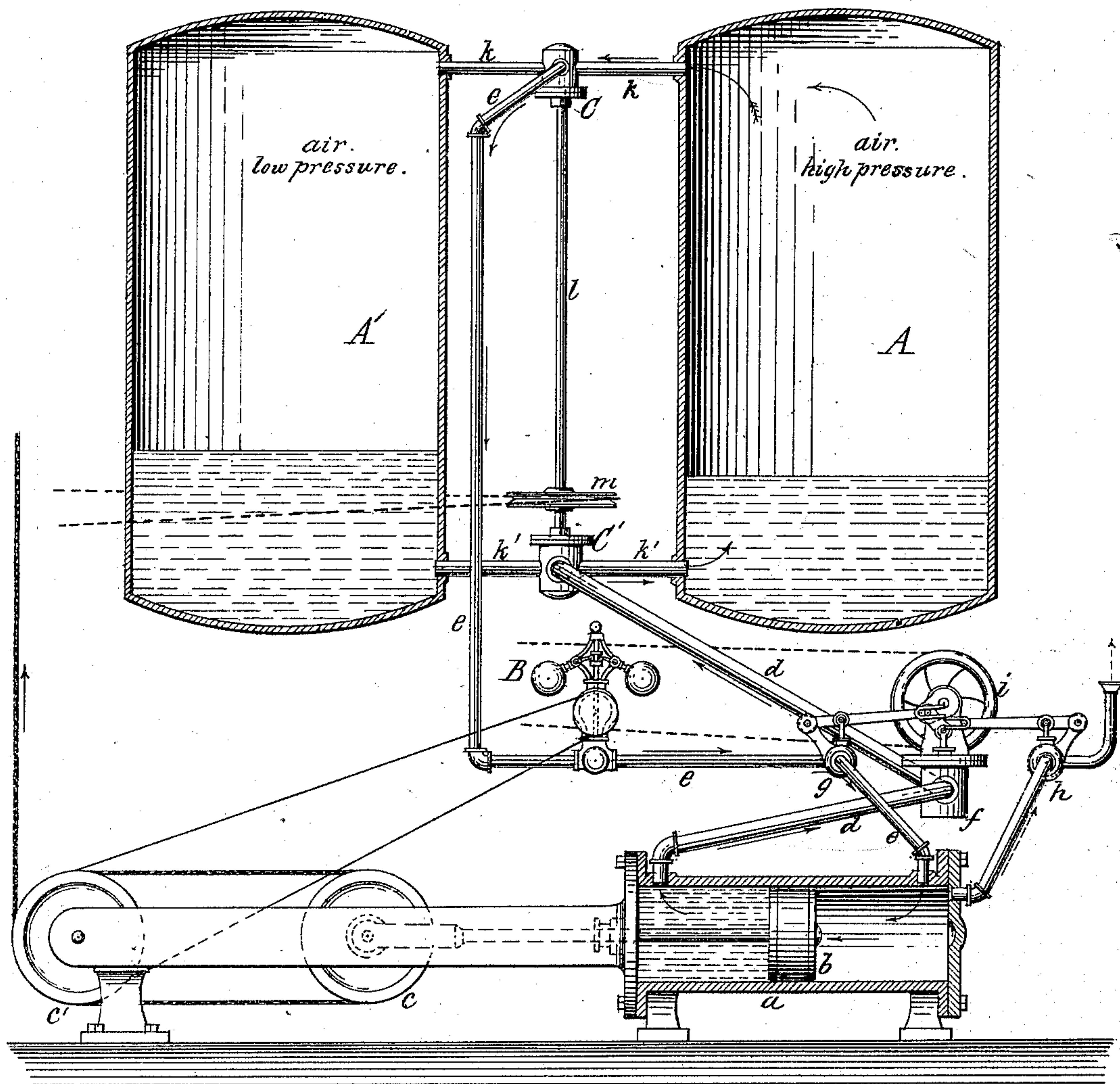


W. M. BAILEY.
Hydraulic-Elevator.

No. 223,464.

Patented Jan. 13, 1880.



ATTEST.

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UNITED STATES PATENT OFFICE.

WALTER M. BAILEY, OF NEW YORK, N. Y.

HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 223,464, dated January 13, 1880.

Application filed October 15, 1879.

To all whom it may concern:

Be it known that I, WALTER M. BAILEY, of the city, county, and State of New York, have invented certain new and useful Improvements in Hydraulic Elevators, of which the following is a specification.

My invention relates to that class of elevators which are operated by a supply of compressed air or other elastic fluid acting on the water-column to propel the elevating-piston, and in which the charge of air is exhausted when the return movement is made.

The present invention aims to dispense with some of the parts heretofore employed in elevators of this class, and to render the apparatus more direct acting and secure greater compactness, and be thus better suited for some situations. Its distinct character may be stated to lie in embodying the air and water reservoirs in the same vessel, in closing each end of the lifting-cylinder, and connecting each end with, respectively, the top and bottom of the air and water reservoir, the water being admissible to one end of the cylinder and the air to the other, and also providing the air end of the cylinder with an exhaust-valve, so that when said exhaust, together with the water-valve, is opened the water is forced directly from the reservoir into the cylinder to effect the lifting movement of the piston, while when the exhaust is closed and the air-valve opened the compressed air enters the rear of the cylinder, balancing the pressure of the water upon the other side, so that during the descending movement of the car the water is returned back to the reservoir, while the compressed air behind the piston is exhausted at the next lifting movement.

The figure in the annexed drawing presents a sectional elevation of my improved elevating apparatus.

a indicates the hydraulic lifting-cylinder; *b*, the piston thereof; *c*, the movable sheaves to which the piston connects, and *c'* the fixed sheaves, over which the cables are wound and extended to the car according to any of the approved modes.

A A' indicate the reservoir or reservoirs, which may be one or more in number. These reservoirs, as shown, form the receptacle both for the supply of compressed air or other elas-

tic fluid for operating the apparatus and also for the charge of water, through the hydraulic column of which the pneumatic pressure is transmitted to the lifting-piston. The compressed air is thus accumulated directly above the water column, and its pressure is thus transmitted directly therefrom through the interposed water to the elevating-piston.

It will also be observed that according to my invention each end of the hydraulic lifting-cylinder *a* is closed, and the front end is connected, through the water-pipe *d*, with the bottom of the reservoirs, while the rear end is connected, by the air-pipe *e*, with the top of the reservoirs; hence the water may be admitted directly from the reservoir into the front of the cylinder against the lifting-piston under the full pressure in the reservoir, while the compressed air may also be admitted from the reservoir under its full pressure upon the back of the piston to balance the pressure in front.

The water-passage *d* is provided with an appropriate controlling-valve, *f*, and the air-passage with a similar valve, *g*, while a third valve, *h*, allows, when opened, a free exhaust from the rear of the cylinder. These valves are preferably mutually connected, so that they are all operated by the cord extending from the sheave *i* on the crank-shaft of the water-valve, and they are so arranged relatively that a movement of the sheave in one direction opens the air and water valve, while the reverse movement shuts both valves; but a continuation of the reverse movement opens the water-valve and also the exhaust-valve, while the air-valve remains closed.

In the drawing the apparatus is represented with the air and water valves open and the piston performing the descending movement, in which condition the novel action of the machine is more apparent, and it will now be observed that the compressed air enters the cylinder behind the piston under the full pressure from the reservoir, thus balancing the hydro-pneumatic pressure on the front of the piston, so that the descent of the car effects the return movement of the piston and causes the water in front of the piston to return back to the reservoir, as indicated by the full arrows.

To stop the piston and car at any desired point will be effected by reversing the sheave *i*, so as to bring the crank to its lower dead-point, thus closing both air and water valves. The ascending movement, however, is effected by continuing the reverse movement of the sheave *i*, which will leave the air-valve closed, but open the exhaust-valve and water-valve, so that the air-pressure behind the piston being thus removed through the open exhaust while the water is admitted in front, the full hydro-pneumatic pressure from the reservoir is thus exerted hydraulically on the front of the piston to raise the car with a positive and steady movement, which may be checked at any point by reversing the sheave and closing the exhaust and water valves.

It will be observed that by this construction I dispense with the intermediate vessel between the reservoir and the cylinder heretofore employed, and thus render the action of the apparatus more direct, and secure the advantage of greater compactness.

To govern the speed of the apparatus I prefer to employ an ordinary governor, B, controlling the flow of air through the air-pipe *e* and driven from the last of the series of the fixed sheaves *e'*, as illustrated.

Another feature of my invention consists in employing two reservoirs or two series of reservoirs, A A', as illustrated, one charged to a low pressure and the other to a high pressure—say, respectively, thirty-five and sixty pounds to the square inch—and connecting the same by two-way cocks with the air and water pipes leading to the cylinder, so that either the low or high pressure may be turned into the cylinder, according as the load on the car is light or heavy, thus securing greater economy in the working of the apparatus.

In the drawing, C C' indicate the two-way cocks between the two reservoirs, from which the air and water pipes *e d* extend to the lifting-cylinder, and *k k'* are the pipes connecting the said cocks with the air and water spaces of the two reservoirs. The air and water cocks C C' are connected by the shaft *l*, fitted with the sheave *m*, from which an independent cord is extended to the car, so that by operating this cord the valves may be opened

in either direction, thus bringing either the high or low pressure into action, according to the requirements of the load.

It will be readily observed that my improved apparatus may be operated by some other elastic fluid instead of air—for instance, by steam; but the use of the latter is not specially contemplated, air being preferable.

I lay no claim in this application to the embodiment in a hydro-pneumatic elevator of a water-reservoir elevated at a height above the lifting-piston to counterbalance the weight of the car, as this feature is shown in a previous application in which I am a joint inventor.

What I claim as my invention is—

1. A hydro-pneumatic elevating apparatus constructed with an air and water reservoir or reservoirs and a lifting cylinder and piston connected at each end, respectively, with the air and water spaces of the reservoirs, whereby the pressure may be transmitted directly from the reservoirs through the interposed water directly upon the lifting-piston to produce the lifting movement, while by opening the air and water valves the pressure will become balanced on each side of the piston, and the water returned to the reservoir during the descending movement, substantially as herein set forth.

2. A hydro-pneumatic elevator constructed with two distinct pressure-reservoirs, one charged with a high and the other with a low pressure, with connections and valves between the same and the lifting-cylinder, whereby either reservoir may be brought into action to exert either a high or low pressure upon the lifting-piston, according to the requirements of the load, substantially as herein set forth.

3. The combination of the lifting-cylinder *a*, the air and water reservoir A, the air and water pipes *e d*, connecting either end of the cylinder with the air and water spaces of the reservoir, the exhaust-valve *h*, and the air and water valves *g f*, arranged and operating substantially as herein shown and described.

WALTER M. BAILEY.

Witnesses:

CHAS. M. HIGGINS.

EDWARD H. WALES.