2 Sheets--Sheet 1.

C. W. BALDWIN.
Hydraulic Elevator.

No. 162,262. Patented April 20, 1875.

Fig. 3.

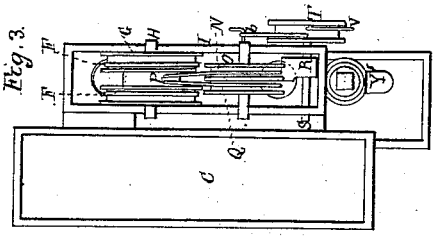


Fig. 4.

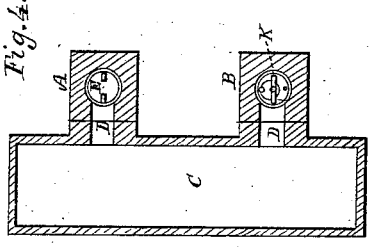


Fig. 1.

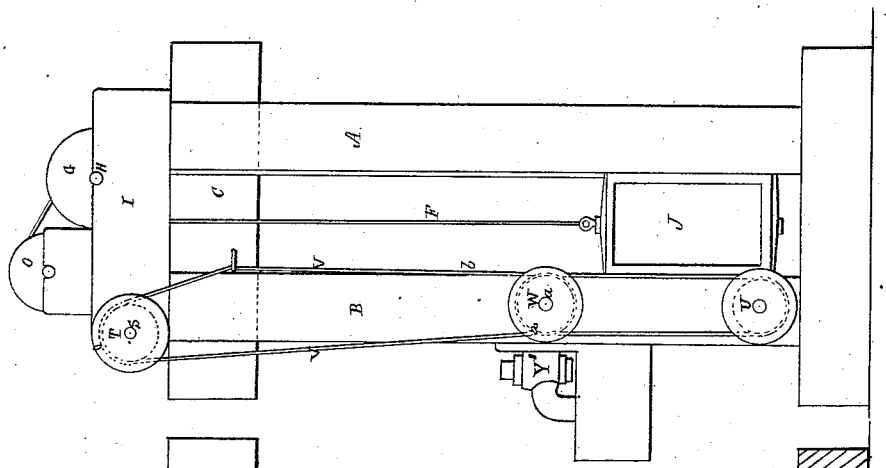
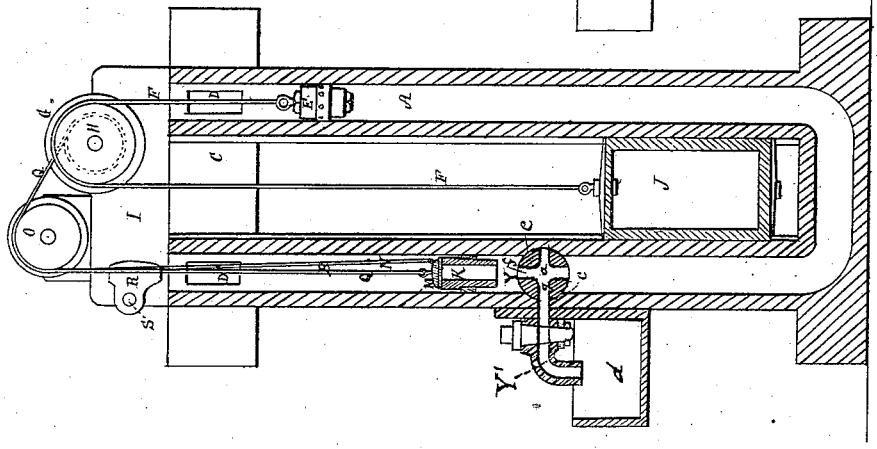


Fig. 2.



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2 Sheets--Sheet 2.

C. W. BALDWIN.

Hydraulic Elevator.

No. 162,262. Patented April 20, 1875.

Fig. 5.

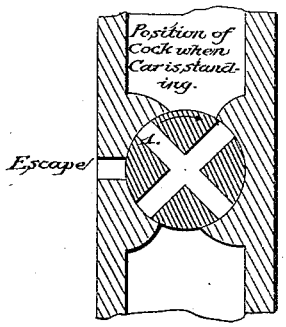


Fig. 6.

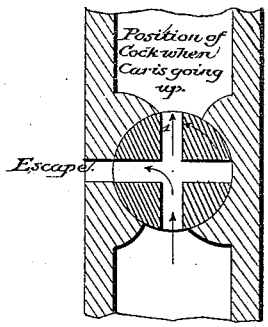


Fig. 7.

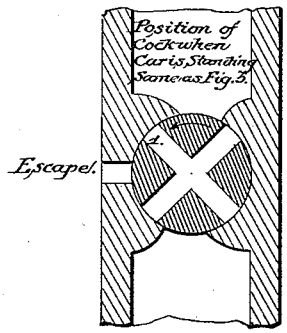


Fig. 8.

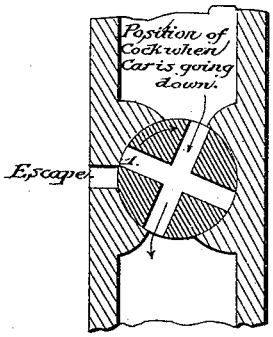
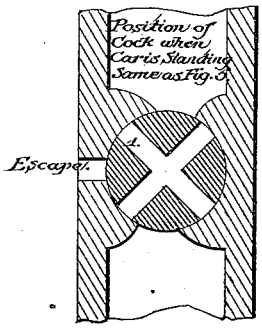


Fig. 9.



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UNITED STATES PATENT OFFICE.

CYRUS W. BALDWIN, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN HYDRAULIC ELEVATORS.

Specification forming part of Letters Patent No. **162,262**, dated April 20, 1875; application filed February 19, 1874.

To all whom it may concern:

Be it known that I, CYRUS W. BALDWIN, of Chicago, Cook county, Illinois, 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 in which the mechanism for lifting the elevator-carriage consists of a piston working within an upright cylinder and forced to descend therein by the weight of a superincumbent column of water within the cylinder.

It is my object, principally, to avoid waste of water, graduating the quantity of water expended or discharged to the weight to be lifted. In this way, while the whole power of the elevator is available at any time, yet I use only so much of that power as is requisite to lift the load, and the remainder or surplus of the power is in effect utilized to carry back to the supply tank or reservoir, and to retain within the apparatus, the water not actually required.

The nature of my invention, and the manner in which the same is or may be carried into effect, can best be explained and understood by reference to the accompanying drawing, in which—

Figure 1 is a side elevation of an apparatus embodying my improvements. Fig. 2 is a vertical central section. Fig. 3 is a top view. Fig. 4 is a horizontal section on line *x y*, Fig. 1.

A B are two water-tight cylinders, of any required height, and made of any proper material. At the bottom they communicate with one another, and at the top they are in free communication, through openings D D′, with the water tank or reservoir C, from which supply of water is afforded the cylinders. The cylinder A, which contains the lifting-piston E, I term the main cylinder. Cylinder B, which contains the graduating valve-piston K and the other appurtenances for giving effect to my invention, I call the graduating-cylinder. The elevator-carriage J, in this instance, moves up and down between the cylinders as guides. It is connected with the lifting-piston by cords, wire ropes, or chains F, passing over drums or pulleys G fixed on an axis, H, as shown plainly in Figs. 2 and 3. The weight of the lifting-piston should about counterbalance that of the carriage. At a point in the graduating-cylinder—say, about thirty feet below the point reached by the lifting-piston in the other cylinder, when the carriage is down—I locate a water discharge or escape, Y′. If this escape be opened when the carriage and lifting-piston are in the position seen in Fig. 2, water will immediately flow therefrom, thus destroying the equilibrium of the two columns and causing the lifting-piston to descend. This movement of the piston is due not only to the pressure of water from above, but also to the downward pull exerted on it by the water from below, for, in effect, at the moment the discharge begins there is a column of water of thirty feet in height—*i. e.*, the difference between the elevations of the escape Y′ and lifting-piston, respectively—which hangs to the under side of the piston and materially increases the power with which it moves. This column, of course, constantly decreases as the piston descends, but this loss is compensated by the lengthening of the column above the piston.

The above-specified distance of thirty feet I find to be most available for my purposes. It may, however, be more or less than that, although the effect cannot be well produced if the distances are very much greater than thirty feet.

To control the flow of water from the escape I make use of a four-way cock, Y, which I have shown as one convenient means of furthering the object I have in view. Various other valve devices may, of course, be used for the same purpose.

The valve device, whatever it may be, for this use, I term the escape-cock. It is required that at times it shall close the cylinder B, and the escape Y′ as well; at other times close the escape and open the cylinder; and at other times open both the escape and the cylinder.

The diagrams, Figs. 5, 6, 7, 8, 9, show, on an enlarged scale, how this is effected with the aid of the cross-passages *f g*.

Valve-piston K is hollow or tubular, with its upper end closed by a flap or hinged valve, M. The piston is suspended by a rope or cord, Q, passing over pulley O and made fast to drum P fixed on the axis H of the pulleys G,

which are revolved by the movement of the cords of the lifting-piston.

Valve M has also a cord, N, for opening it, and this cord also runs over pulley O, and is fast to drum P. The valve-piston in this instance travels up and down in its cylinder about three-fourths only of the distance traveled by the lifting-piston. The drum P, therefore, is proportionately smaller than the pulley G. The escape-cock Y has a stem, *a*, extending out through cylinder B, on which stem is a pulley or wheel, W, to which is made fast the valve-cord V. This valve-cord extends from top to bottom of the apparatus, passing over pulleys T U, as shown. It is fast to the upper pulley T, and to the axis S of this pulley is fixed an eccentric, R, which has its outer end against or so as to engage the cord N of the valve M. A movement of this eccentric in either direction will operate or bend the cord in such manner as to lift the valve M. There is sufficient play between the eccentric and its cord to allow the valve-cord V to be pulled sufficiently to open the escape-cock before the valve M is operated.

By means of the devices described I am enabled to graduate the quantity of water expended to the weight of the load. The cylinders, of course, are supposed to be filled at all times with water from supply-tank C. When the carriage J is down, as seen in Fig. 2, and at rest, the escape-cock Y is in the position shown in Fig. 5. Suppose the elevator to be loaded to its full carrying capacity. To lift this load the escape-cock is revolved to the right to assume the position shown in Fig. 6, and the valve-cord is pulled far enough to open wide the valve M. All the water below the lifting-piston will, under these conditions, pass out through escape Y′, and the elevator will work at its full power; but suppose the load to be lifted is but one-half or one-quarter that which can be lifted. In this case the escape-cock is opened as before, but the valve-cord is pulled far enough to open valve M only slightly—just sufficient to start the carriage. In this case, as the valve-piston rises, there is a constant tendency beneath it to a vacuum or partial vacuum, which has the effect of carrying up through and above the escape-cock a portion of the water that would otherwise escape. This water is kept in the cylinder when the car stops in its upward ascent, inasmuch as the four-way cock, to arrest the car, is turned to the left from the position in Fig. 6 to that in Fig. 7, which is the same as Fig. 5. Now, when the car is to descend, the valve-cord is pulled to turn the escape-cock to the right and to the position shown in Fig. 8, where the escape is closed, but the cylinder is open. The carriage will now descend, and the piston K will, following the down movement of the carriage, descend to its original position in the cylinder B above escape-cock Y. The down movement of the carriage is arrested by bringing the escape-cock to the position shown in Fig. 9. The next upward movement of the valve-piston will have the effect of lifting the body of water above the piston into the tank C. I thus, in effect, utilize the surplus power of the elevator to carry back to the supply-tank the water not needed to produce the lifting action. So far as this graduating action is concerned, it is not necessary that the escape should be located with respect to the lifting-piston, as hereinbefore explained, for the escape from the main cylinder may lead into a tank at the bottom of the apparatus, and from this tank a suction-pipe may lead to the graduating cylinder; but to give effect to both the objects I have in view I prefer to combine the two elements in the manner substantially as described.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, with the two communicating upright cylinders, of the lifting-piston in the one cylinder and the water-escape in the other cylinder, located with respect to the lifting-piston, substantially as shown and described.

2. The combination, with the main cylinder and graduating cylinder, of the lifting-piston, water-escape, and graduating valve-piston, for joint operation, as shown and set forth.

3. The combination, with the graduating cylinder, of the escape, the escape-cock, and the graduating valve-piston, arranged and operating as shown and set forth.

4. The graduating piston and its valve, in combination with the escape-cock and the valve-cord, and intermediate mechanism, by which said valve and cock are connected and operated, substantially as set forth.

5. The combination, with the water-supply reservoir, the main cylinder, the lifting-piston, and the elevator-car, of the escape, the escape-cock, the graduating piston, and its valve, for joint operation, as shown and set forth.

6. In combination with the main and graduating cylinders, elevator-car, and lifting-piston, the graduating piston, provided with a valve opening upward, and arranged to rise in the graduating cylinder when the car rises, substantially as shown and set forth.

CYRUS W. BALDWIN.

Witnesses:

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L. SUMMERFIELD.