

(No Model.)

W. E. HALE.
HYDRAULIC ELEVATOR.

No. 253,040.

Patented Jan. 31, 1882.

Fig. 1.

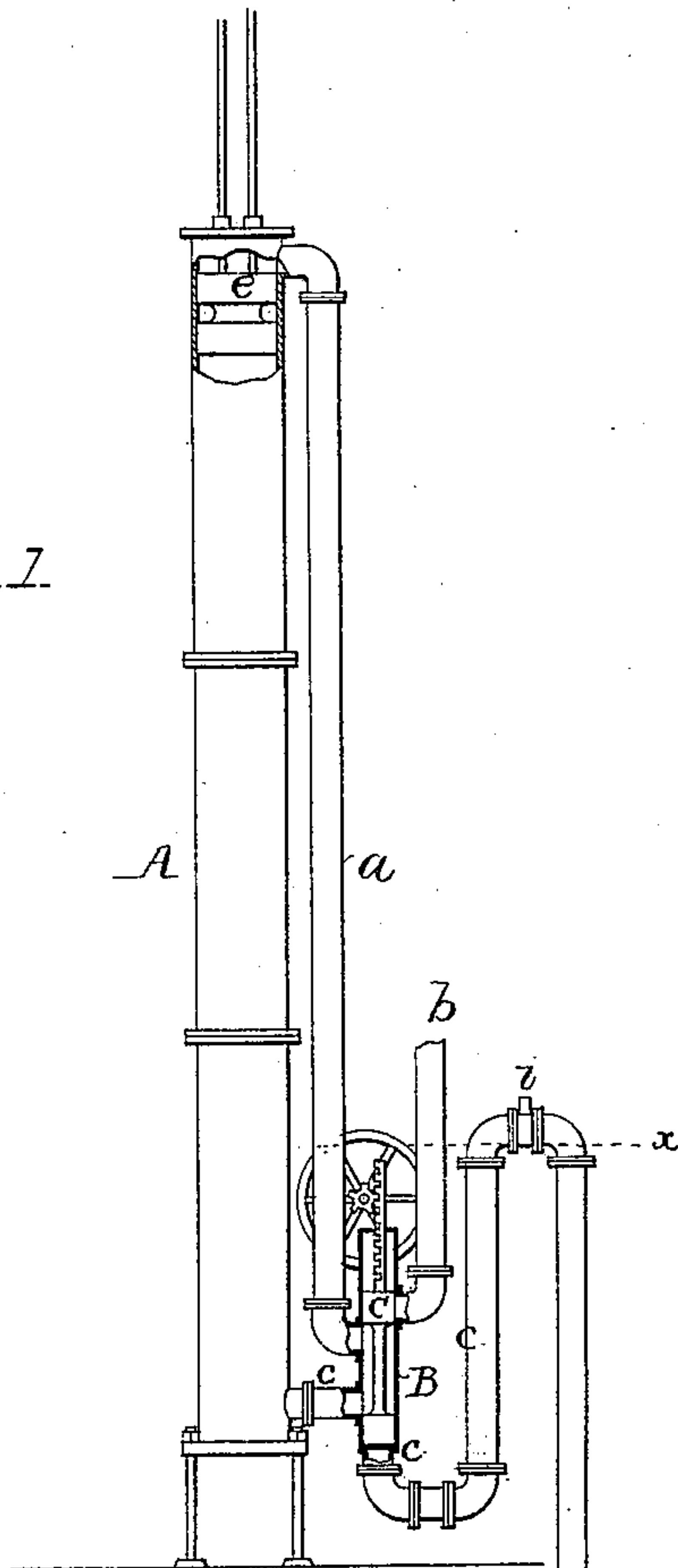
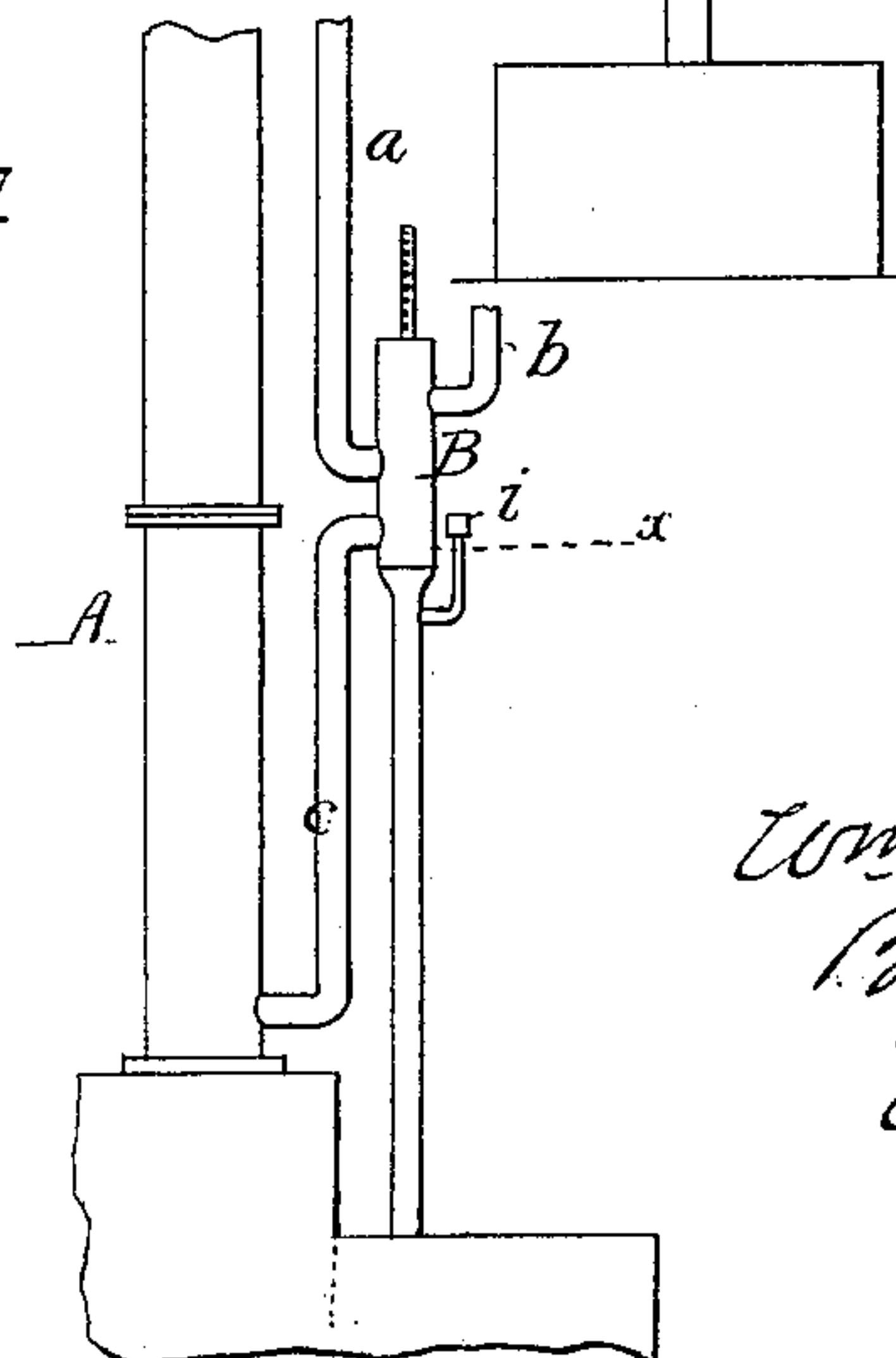


Fig. 2.



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UNITED STATES PATENT OFFICE.

WILLIAM E. HALE, OF CHICAGO, ILLINOIS.

HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 253,040, dated January 31, 1882.

Application filed April 16, 1880. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. HALE, of Chicago, Cook county, Illinois, have invented an Improvement in Hydraulic Elevators, of which the following is the specification.

The object of my invention is to secure in a hydraulic elevator a travel of the working piston of more than thirty-three feet—that is, for a length greater than that of the column of water the atmosphere will support—without causing a vacuum and without unduly increasing the weight of water upon the piston.

In the drawings forming part of this specification, Figure 1 illustrates in elevation the cylinder and piston, pipes, and valves of a hydraulic elevator, showing my invention; and Fig. 2, the same, the valve arranged at a higher level.

A is the cylinder, of over thirty-three feet in length, the line *x* indicating a point thirty-three feet, or thereabout, from the upward limit of the piston's travel. *e* is the piston; *a*, a pipe extending from the top of the cylinder to the line *x*; *c*, a pipe extending from the bottom of the cylinder upward to the line *x*. B is a casing containing a valve, C, and communicating with both pipes *a* *c* and with a water-supply pipe, *b*.

The discharge-pipe *c*, after meeting the line *x*, may be extended down to a tank which receives the discharge-water, an air-inlet valve being arranged at *i* to prevent siphoning.

The valve C is combined with appliances whereby it may be operated from the cage, and is constructed so as in one position to permit the water to flow from below the piston while the supply of water under pressure passes to the top and raises the cage, and in the reverse position to permit the water from above the piston to pass down the pipe *a* and to flow back from the pipe *c* to the space below the piston when the weight of the car raises the piston, or to close the parts and by stopping all flow of water hold the cage in any position.

At any point of the movement of the piston the column of water above the same is counterbalanced by the water in the outside column, so that there is no accumulating load of water on the piston as it travels downward, which would not be the case were there no counterbalancing-column.

In connection with the column counterbal-

ancing the water above the piston the second column, extending from the lower end of the cylinder to the line *x*, counterbalances that column of water in that portion of the cylinder extending below the line *x*. The second column is contained in the pipe *c*, and the effect is such that when the piston is at the bottom of the cylinder no greater load is required to lift it than when it is at any point above the line *x*. The further effect is to supply the extended portion of the cylinder with water as the piston rises, and to maintain this portion full of water, so that when the piston is at the limit of its upward movement the column supported by atmospheric pressure is not over thirty-three feet in length, and the vacuum which would be caused below the piston if the discharge were below the line *x* is prevented. By this combination of columns I overcome the objections heretofore incident to the use of cylinders greater in length than the height of the column which can be supported by atmospheric pressure.

It will be obvious that the valve may be placed at any point in the pipes *a* *c*, whether above, below, or upon the line *x*, and that different valve arrangements may be used without departing from the essential feature of my invention, which consists in counterbalancing the water in a cylinder of over thirty-three feet in length by means of outside columns extending downward and upward to a point about thirty-three feet below the limit of the upper travel of the piston.

Fig. 2 shows the valve-chest arranged near the line *x*, in which case it is not necessary to extend the pipe *c* upward to said line after leaving the chest, as in Fig. 1.

It will be obvious that the same effect will be produced, whether the apparatus is constructed to discharge the water on the upward or downward movement of the piston.

I claim—

1. The lifting-cylinder of a hydraulic elevator, in combination with pipes extending downward and upward from each end of the same to a point about thirty-three feet below the limit of the upper travel of the piston, whereby the column of water in a lifting-cylinder of over thirty-three feet in length is counterbalanced, substantially as and for the purpose described.

2. The lifting-cylinder of a hydraulic elevator

exceeding thirty-three feet in length, in combination with a pipe communicating with one end thereof and serving as a discharge-pipe, and also to hold a counterbalancing-column for the water on one side of the piston and a pipe communicating with the other end of said cylinder, and adapted to hold water to counterbalance the water on the opposite side of the piston, and suitable valve appliances for controlling the water and regulating its admission and discharge, substantially as set forth.

3. The lifting-cylinder of a hydraulic elevator exceeding thirty-three feet in length, in combination with a discharge-pipe connecting with the upper end of said cylinder, a counterbalancing-pipe connecting with the lower end of the same, and suitable valve appliances, said pipes being arranged so that the column of water in said lifting-cylinder below the piston is counterbalanced, substantially in the manner set forth.

4. The lifting-cylinder of a hydraulic elevator exceeding thirty-three feet in length, in combination with a combined supply and discharge

pipe connecting with the upper end of said cylinder, and suitable valve appliances controlling the supply and discharge, and a counterbalancing-pipe connecting with the lower end of the lifting-cylinder, whereby the column of water in the said cylinder below the thirty-three-foot level is counterbalanced, substantially as set forth. 25 30

5. The combination, with the working-cylinder of a hydraulic elevator closed at both ends, provided with piston and piston-rod, inlet and discharge openings, pipe containing an upper counterbalancing water column, and valve appliances, of a discharge-pipe extending upward from the end of the cylinder to a point above the bottom to discharge the water at a level above the bottom, substantially as set forth. 35 40

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM E. HALE.

Witnesses:

CHARLES E. FOSTER,
WILLIAM PAXTON.