H. E. BATHRICK.

HYDRAULIC ELEVATOR.

No. 178,711. Patented June 13, 1876.

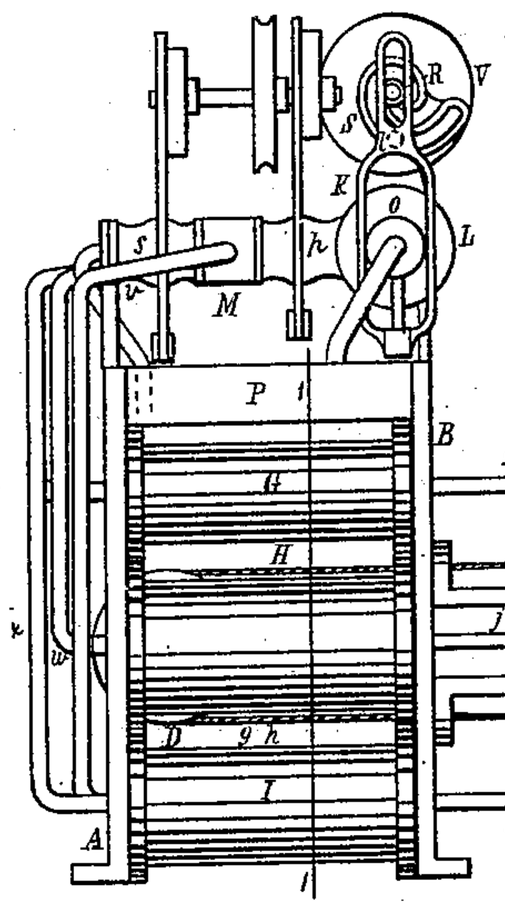


Fig. 1.

Fig. 2.

Fig. 3.

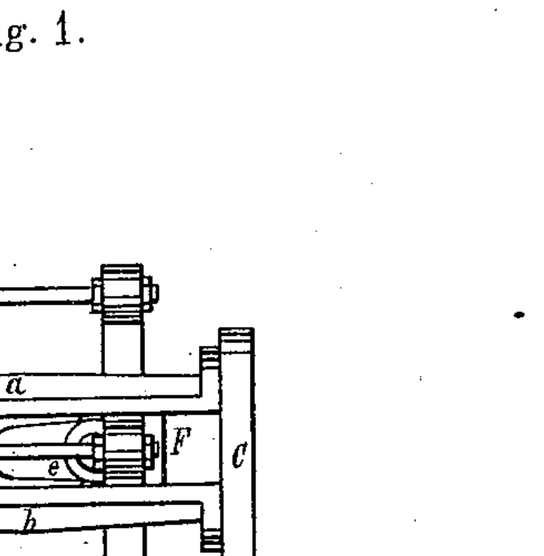
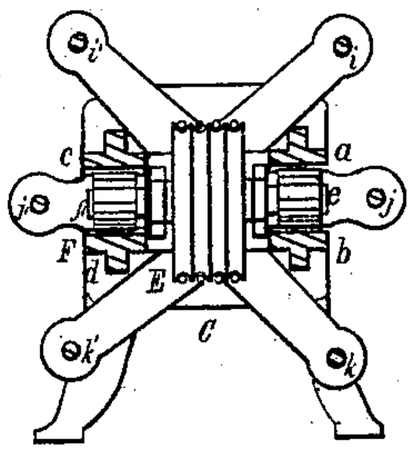


Fig. 4.



Witnesses;

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UNITED STATES PATENT OFFICE.

HENRY E. BATHRICK, OF SOMERVILLE, MASSACHUSETTS.

IMPROVEMENT IN HYDRAULIC ELEVATORS.

Specification forming part of Letters Patent No. **178,711**, dated June 13, 1876; application filed September 9, 1875.

To all whom it may concern:

Be it known that I, HENRY E. BATHRICK, of Somerville, in the county of Middlesex and State of Massachusetts, have invented a new and useful Improvement in Hydraulic Elevators, which improvement is fully set forth in the following specification, reference being had to the accompanying drawings.

The object of my invention is, first, to use, in combination with sheaves for gaining speed and length of motion of hoisting-rope, cylinders of different sizes, for the purpose of proportioning the amount of water used to the weight raised; secondly, to so arrange the cylinders in reference to the central line of draft, as necessitated by the position of the sheaves, that the pressure exerted in opposite cylinders shall maintain an equilibrium of draft relative to said central line; thirdly, to so locate the sheaves within the system of cylinders that the least amount of rope is required, and the least amount of space occupied by the machine; fourthly, to fill the cylinders which do not receive the water under pressure with the waste-water, to avoid the objectionable results arising from admitting air in the cylinders, and to use a tank to receive this waste-water for filling the cylinders; fifthly, an improved arrangement of cams and connections for operating valves.

In the drawings, Figure 1 represents an elevation of so much of a hydraulic elevator as will embody my invention. Fig. 2 is the left-hand end view of machine, as shown in Fig. 1. Fig. 3 is a vertical section taken on, and a view of so much as may be seen beyond to the left of, line 1 1 of Fig. 1. Fig. 4 is a vertical cross-section taken on, and a view of what may be seen beyond to the right of, line 2 2 of Fig. 1.

A, B, and C are supports for the machine. The set of sheaves D, that are stationary as far as rectilinear motion is concerned, is suitably connected with support A. The set of sheaves E, that have the rectilinear movement, is suitably held by the cross-head F. The latter moves along guides *a b c d*, retained in line of travel thereby, and relieved of much friction thereon by the rolls *e f*. These guides are held by the supports B and C, as shown. Two hoisting-ropes, *g* and *h*, are here shown, though any number may be used, as the case may require. Greater safety is attained by the use of two or more than by one hoisting-rope, and I have found that they may be thus used with sheaves with the most satisfactory results. Each of these ropes passes about the sets of sheaves D and E, and from machine to car, in the usual manner. The cylinders are held in position by the supports A and B, being bolted thereto by the end flanges, and are arranged about the sheaves, and the ropes passing between the two sets. There may be any number of cylinders, as may be desired, six (G G′, H H′, I I′,) being here represented, also shown as arranged in pairs, two directly opposite ones constituting a pair, being of equal size—that is, of the same diameter—while those of different pairs differ in size.

By a proper arrangement of ropes and sheaves the central line of the draft, caused by the moving of set of sheaves E from set D, may coincide with a line passing through the center of both sets of sheaves. Should then the cylinders constituting what I speak of as a "pair" be of equal size, they will be placed at equal distances from said central line. It appears best to have two opposite cylinders of equal size; but this is not absolutely necessary, for they might be unequal in size, in which case they should be placed at unequal distances from the central line defined above. The pistons for cylinders are connected, by rods *i i′ j j′ k k′*, to suitably-disposed arms projecting from the cross-head F.

The water for operating the machine passes into a chamber, L, from the main pipe *m* by the valve *n*. This chamber has also an outlet-valve, *o*. Connected with chamber L are the chambers M N O, by the inlet-valves *p q r*, there being corresponding outlet-valves *s t u*.

From the chambers M N O pass the feed-pipes *v w x*, each one connected with both of a pair of opposite cylinders. A tank, P, is located in a suitable position to receive the water which passes from pipes connected with all the outlet-valves *o s t u*, as shown. All waste-water more than is necessary to be retained for filling cylinders, as before mentioned, passes away from tank P by a proper conduit. (Not here shown.)

Now, with arrangement of parts as shown

and described, I am able to use water in proportion to the weight of several different loads raised. With three pairs of cylinders, as shown, I can, by the use of one pair and the different combinations of several pairs, raise seven different loads, using only that amount of water necessary for each load.

To operate the machine I first close the outlet-valve *o*, and then open the main inlet-valve *n*, which allows the water under pressure to pass into the chamber L. I then open one or more of the inlet-valves *p q r*, the corresponding outlet-valves *s t u* having been also previously closed, which allows the water to pass into one or more of the chambers M N O, and thence to one or more pairs of cylinders, G G′, H H′, I I′. This water under pressure, in whatever cylinders it is allowed to enter, presses against the pistons, and, by the rods, moves the cross-head F, carrying the sheaves E from the set D, taking up and speeding the hoisting-ropes, as before mentioned, and raising the elevator-car. To lower the car it is simply necessary to reverse the main valves—that is, close *n* and open valve *o*—when the draft on the ropes caused by the weight of car will draw back sheaves E toward set D. This operation, by reversing movement of pistons, forces the water out of the cylinders into tank P, from which it will be drawn back into all those cylinders which do not receive the water under pressure at the next operation of hoisting. Thus all air is excluded from the cylinders that is on that side of the pistons where the pressure is exerted, which, otherwise admitted, causes rusting of cylinders and unsteadiness of motion. It will be noticed that it is not necessary to move the supplementary valves connected with chambers M N O at every operation of hoisting, but only when there is a change in weight of the loads to be hoisted and it is desirable to economize the water.

The construction of the several sets of valves and connections is similar, and it is only needful to refer to one set in description, as the main valves *n* and *o*. On a shaft, R, are placed two cams, S T. Pins *l z*, fixed to the connecting rods or links K J, move in the cam-grooves. The links are firmly attached to the valve-stems and further guided by the shaft R, which passes through the slots at the other or upper extremities of the links, as shown. The cams are so constructed that a partial revolution will keep the pins *l z* at the same distance from the shaft, hence causing no movement of valves; but a further revolution will carry the pins away from shaft, and thus open the valves, reverse revolution causing reverse effect, shutting the valves. The cams are so set on shaft in reference to each other that the stationary condition of one valve while the shaft is revolving shall be alternated by the movement of opening or closing of the other valve. The shaft receives its motion by the pulley V, about which passes the shipping-rope.

The cost of running hydraulic elevators depending directly upon the amount of water used, it has long been a desideratum to proportion the amount of water used to the weight raised. This I do to the extent hereinbefore set forth, and by machinery that in other respects, also, is very efficient in economizing all the power exerted. I do it while using the direct pressure of water acting in cylinders, which has been found to be the nearest perfect of any method. The economy of space gained and other useful features of my machine are evident without further explanation.

I claim as my invention—

1. Two or more cylinders of different diameters, and arranged parallel to each other, when used in a hoisting-machine, in combination with two sets of sheaves, substantially as and for the purpose hereinbefore set forth.

2. In a hoisting-machine, one or more pairs of cylinders, in combination with two sets of sheaves, the cylinders of each pair being arranged opposite to each other and in relation to central draft, substantially as hereinbefore described.

3. The set of sheaves D, in combination with two or more cylinders, when placed between said cylinders, substantially as and for the purpose hereinbefore set forth.

4. In a hoisting-machine, a tank, P, in combination with two or more cylinders, substantially as and for the purpose hereinbefore set forth.

5. In a hydraulic hoist, the cams S T, links K J, and valves *n o*, when constructed, arranged, and combined substantially as hereinbefore described.

HENRY E. BATHRICK.

Witnesses:

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