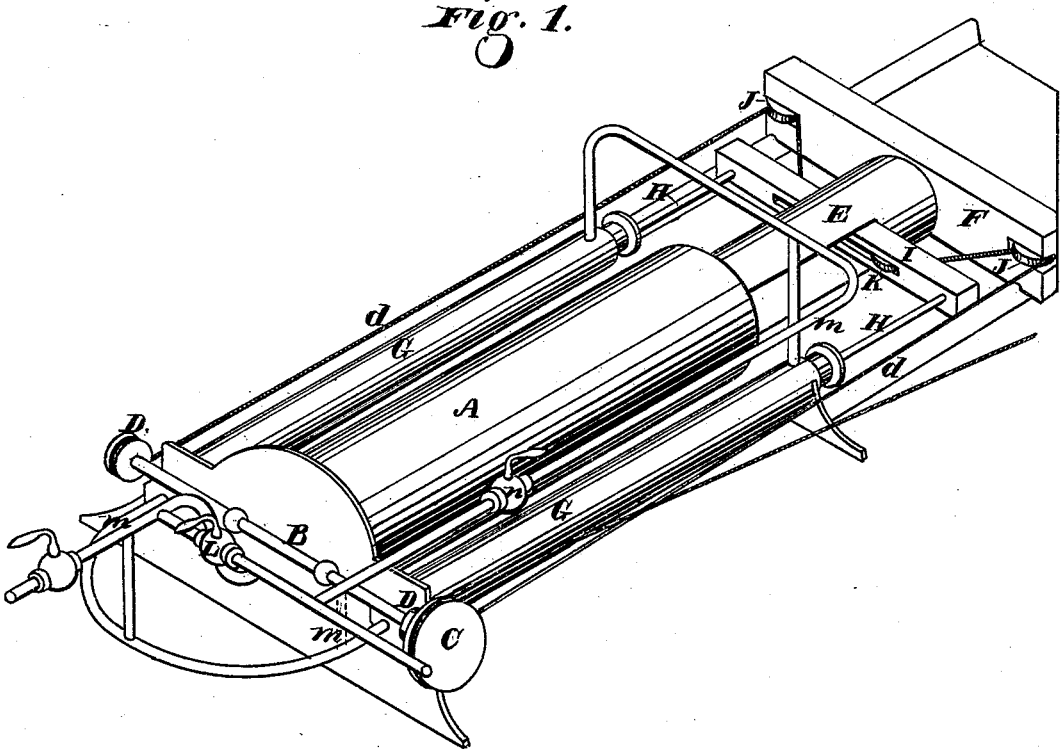
2 Sheets—Sheet 1.

J. PERKINS.

HYDRAULIC ELEVATOR.

No. 180,495. Patented Aug. 1, 1876.

Fig. 1.



Witnesses

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2 Sheets—Sheet 2.

J. PERKINS.

HYDRAULIC ELEVATOR.

No. 180,495. Patented Aug. 1, 1876.

Fig. 2.

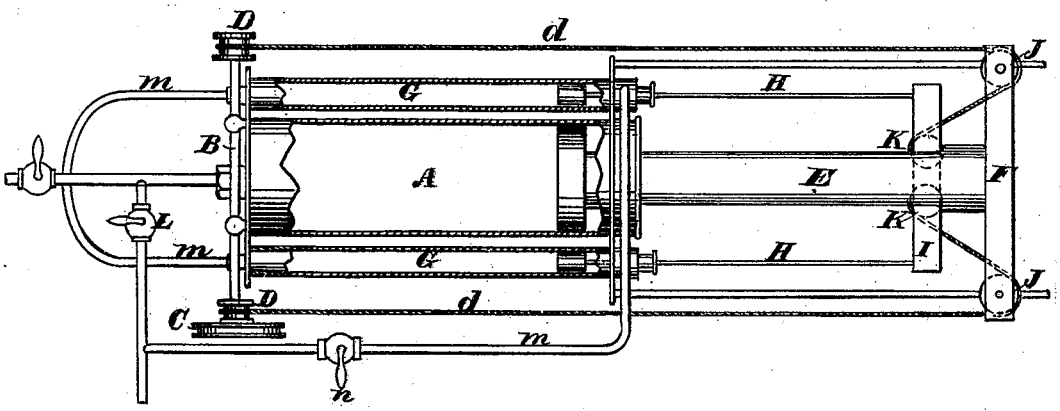
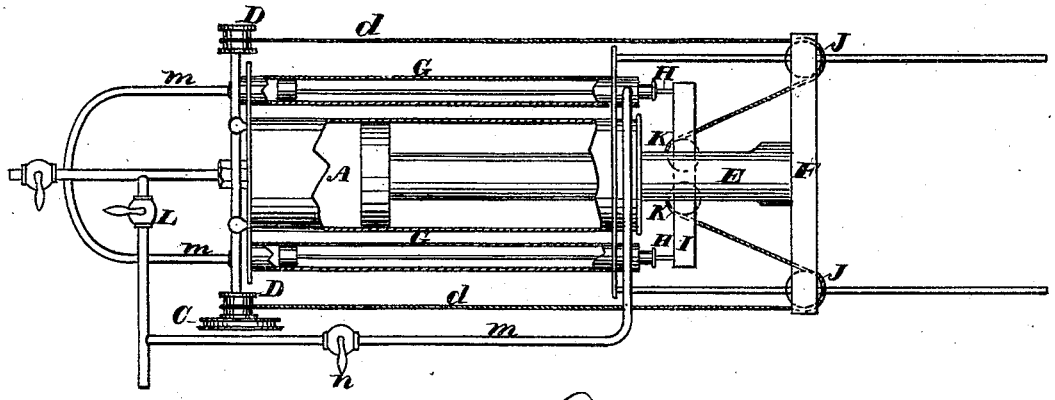


Fig. 3.



Witnesses

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UNITED STATES PATENT OFFICE.

JOSEPH PERKINS, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN HYDRAULIC ELEVATORS.

Specification forming part of Letters Patent No. **180,495**, dated August 1, 1876; application filed May 9, 1876.

To all whom it may concern:

Be it known that I, JOSEPH PERKINS, of the city and county of San Francisco, State of California, have invented an Improved Differential Hydraulic Elevator; and I do hereby declare the following description and accompanying drawings are sufficient to enable any person skilled in the art or science to which it most nearly appertains to make and use my said invention without further invention or experiment.

The object of my invention is to provide certain improvements in hydraulic elevators; and it consists in the employment of one or more main hoisting-cylinders, in combination with supplemental cylinders or brakes, which serve by their action and connections to modify the operations of the main pistons in such a manner that a heavy load may be raised at a certain speed when all the pistons move together; but when the supplemental pistons are prevented from moving, pulley-connections, through their uniting cross-heads and that of the main pistons, will so multiply the travel of the hoisting-rope that the cage will be raised to its full height by a movement of the main pistons over a small portion of the length of the cylinder. By allowing the operating piston or pistons to move at a different speed from that of the supplemental pistons, I am enabled to regulate the speed and power to the load to be raised; and this may be accomplished either at starting or at any part of the ascent of the load.

Referring to the accompanying drawings for a more complete explanation of my invention, Figure 1 is a perspective view of my elevator. Fig. 2, Sheet 2, is a horizontal section of the cylinders, showing the pistons acting together. Fig. 3, Sheet 2, is a horizontal section, showing the pistons in their diverse positions.

A is a main or hoisting cylinder, of which as many may be employed as may be desired. This cylinder I form of any suitable material, and the inside is lined with any material which will not be injuriously corroded by salt-water. B is a shaft, which carries the hoisting-drum C and the pulleys D D. For convenience, I have shown this shaft extending across one end of the cylinder A, while the piston-rod E extends out through the opposite head, and is provided with a cross-head, F, and the ropes *d d* from the pulleys D D extend to this cross-head, parallel with the sides of the cylinder. Upon each side of the main cylinder I have shown supplemental cylinders G G, whose piston-rods H extend out at the same end with the rod E, and are united by a cross-head, I, which either passes through the rod E, or it may encircle it or be otherwise fitted to work in a mechanical manner. The ropes *d*, which extend from the pulleys D D to the cross-head F, as above described, pass around the pulleys J at this point, thence extending to pulleys K in the cross-head I, and being carried from this point up in the center, so as to be finally secured to the cross-head F, as shown.

It will be seen that when the main piston is forced forward by the pressure of a column of water, which is admitted by means of the pipe L, its piston and cross-head will be forced outward, drawing the ropes *d*, which will thus rotate the pulleys or drums D, and with them the drum C, upon which the hoisting-rope is coiled. If the pistons in the small cylinders are allowed to move freely the strain upon the ropes *d*, passing over the pulleys J and K, will tend to draw the cross-head I toward the cross-head F, thus causing all the pistons to move together, and the length of the ropes *d* which will be drawn off the drums D will be just equal to the travel of the pistons. If, however, the pistons in the supplemental cylinders be entirely or partially stopped, the cross-head I will be equally retarded, and as the cross-head F moves outward the amount of rope drawn from the drums D will be increased in ratio to the number of multiplying-pulleys J and K and the difference between the rates of motion of the cross-heads F and I. This difference in motion, or the entire stoppage of the cross-head I, may be accomplished by various means; but I have found the use of what I term a "water-brake" to be very efficient. This consists in connecting the ends of each of the cylinders G G by pipes *m* and cocks, so that the water may either be entirely stopped before the pistons, or it may be allowed to flow from one side to the other of the pistons more or less freely. If the cock *n* be entirely closed, the water which is in front of the

pistons in G G will be prevented from passing out, and the piston will consequently be prevented from moving. As the water is let into the main cylinder A, so as to drive its piston forward, the cross-head F will be moved, while the cross-head I, which unites the piston-rods H, will be held stationary. This will cause the multiplying-pulleys J and K to act upon the ropes *d*, so as to take up a larger proportion, and by this means enough of the rope will be drawn off the pulleys D to elevate the load by a short travel of the main piston.

It will be seen that if the cock *n* is partially opened, the pistons in the cylinders G will have some motion, and the difference between the movement of these pistons and the main piston will determine the distance which the main piston travels in elevating the load, and consequently the power expended.

The water for the supplemental cylinders may be taken from the same pipe that supplies the main cylinder, or it may come from some other source. It may also, by a proper arrangement of the pipes, be simply transferred from one end to the other of the cylinders, instead of being allowed to pass off.

By a proper adjustment of the cock *n*, an automatic regulation of the engine is obtained, for, by reason of the greater pressure which an increased load causes upon the pistons in the cylinders G, the passage of water through the cock *n* will be accelerated, thus giving greater speed to the pistons, and the increased resistance of the load will at the same time retard the speed of the pistons in the cylinder A, so that the rate of speed of the cross-heads becomes nearer alike as the load is increased, until the full capacity of the engine is reached, when the rate of speed of all the pistons will be the same. This retarding of the system of pulleys K in relation to the movement of the pulleys J I have shown to be accomplished in the present case by means of the supplemental cylinders, with their pistons, connecting-pipes, and cocks, making a hydraulic brake; but it will readily be seen that this might be accomplished by various mechanical brakes, frictional or otherwise. The water-brake seems to me, however, to be the most feasible and least liable to derangement.

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

1. The operating-cylinder A, with its piston and rod, in combination with the supplemental cylinders G, having their piston-rods H so connected with the rod E of the operating-cylinder as to serve as regulators, and adjust its speed and power to the load, substantially as herein described.

2. The cylinder A, with its piston-rod E and cross-head F, in combination with the cylinders G, with their piston-rods H and uniting cross-head I, pulleys J and K, and ropes *d*, for obtaining a differential motion of the two sets of pistons, substantially as herein described.

3. The cylinders A and G, with their piston-rods, cross-heads, and pulleys, as shown, together with the pulleys D upon the shaft B, and the ropes *d*, substantially as and for the purposes herein described.

4. The pipes *m*, for connecting the opposite ends of the cylinders G, and the regulating-cock *n*, for the purpose of rendering the engine self-regulating, substantially as herein described.

5. A hydraulic elevator constructed with a system of pulleys, J and K, one or more of which pulleys are retarded by a brake, so as to give greater or less motion to the winding-drum, in proportion to the motion of the piston in the working-cylinder, substantially as described.

In witness whereof I have hereunto set my hand and seal.

JOSEPH PERKINS. [L. S.]

Witnesses:

GEO. H. STRONG,

CHAS. G. PAGE.