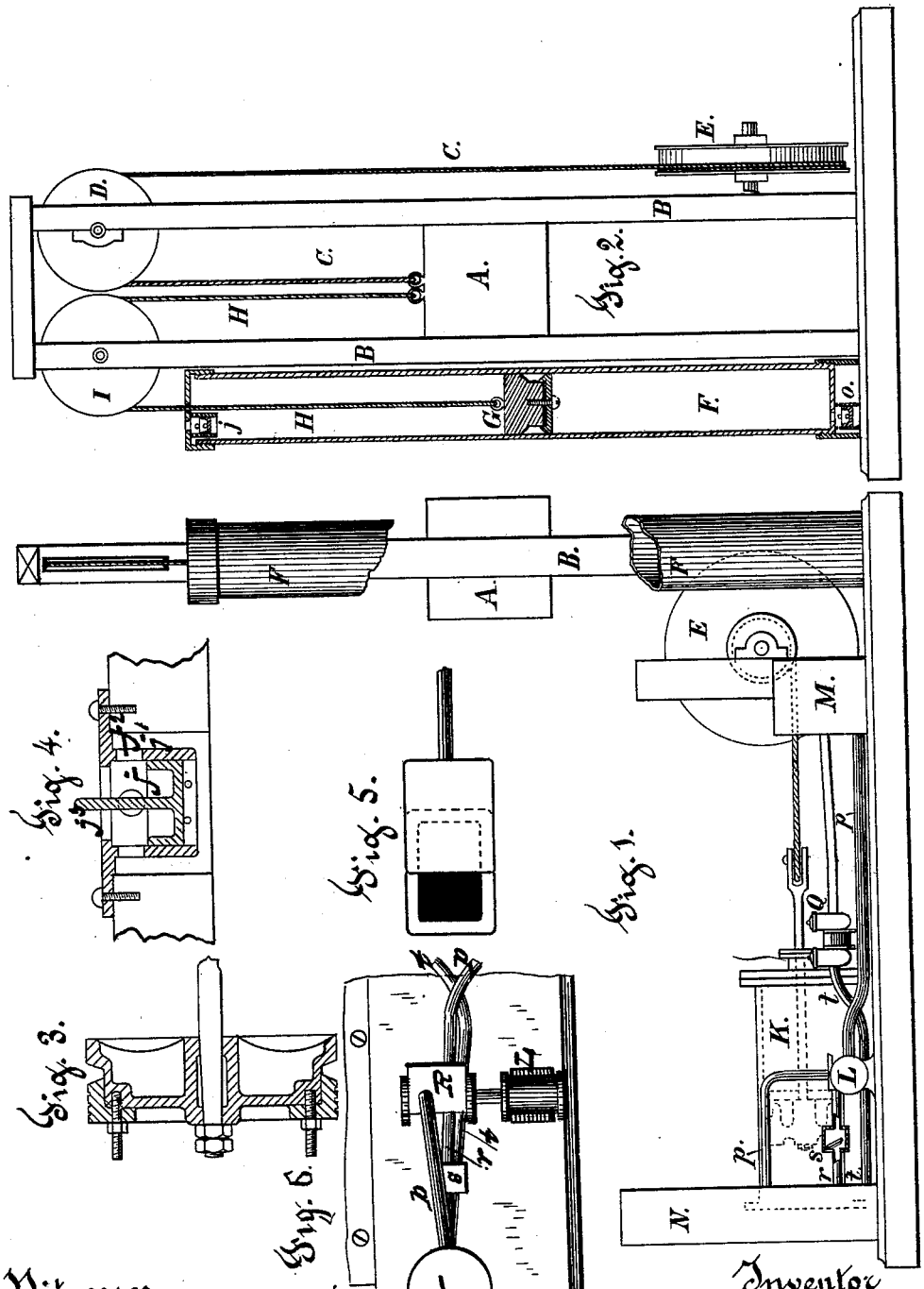
P. HINKLE.
Elevator.

No. 220,758. Patented Oct. 21, 1879.



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UNITED STATES PATENT OFFICE.

PHILIP HINKLE, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN ELEVATORS.

Specification forming part of Letters Patent No. **220,758**, dated October 21, 1879; application filed May 1, 1879.

To all whom it may concern:

Be it known that I, PHILIP HINKLE, of the city and county of San Francisco, and State of California, have invented certain new and useful Improvements in Elevators; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings.

My invention has reference to elevators for hoisting loads from one floor of a building to another; and it relates, first, to a safety-brake for preventing the cage from falling suddenly in case the hoisting-rope should be ruptured; secondly, to an arrangement for preventing the reaction of the water from the accumulator-tank, reservoir, or chamber against the pump-valves at the termination of each stroke of the piston; thirdly, to an improved manner of constructing the valve for opening and closing the water-passages which conduct the water to and from the hoisting-cylinder; and, lastly, to an improved construction of the piston and to secure and spread the packing, all as hereinafter more fully described.

Referring to the accompanying drawings, Figure 1 is a side elevation, and Fig. 2 a front elevation, of my improved elevator. Fig. 3 is a detached sectional view of piston. Fig. 4 is a detached sectional view of air-valve. Fig. 5 is a detached view of my improved square valve and valve-seat. Fig. 6 is a detail plan view, showing the accumulator-chamber, the pump, its valve-chamber, and the arrangement of pipe-connections, with valve between them.

Let A represent an elevator platform or cage, and B B the upright guides between which it moves. C is the hoisting-rope, which leads from the platform or cage A up over a pulley, D, and thence down to the hoisting-pulley E, in the ordinary manner of constructing elevators. In any case the continual strain upon this rope, whether it be made of metal or hemp, gradually destroys its tenacity, and it is liable to break at any time and allow the cage to drop.

In the case of a wire rope the crystallization of the metal which results from bending it back and forth over the upper pulley weakens it, so that, sooner or later, it will break without giving any premonitory indications of its weakness.

Safety-clutches have been employed for arresting the fall of the cage under such circumstances; but these devices are not reliable because they are not called into action until an accident happens, which is only at long intervals, so that their joints become stiff and they fail to act.

My safety device is an active member of the elevator mechanism, moving when the cage moves, and serving also at all times as a regulator of the downward speed of the cage. It consists of an upright cylinder or tube, F, which can be placed near the upright guides B B, or at any place convenient to the elevator. This cylinder or tube is as long as the lift of the cage, and its upper end is closed by a cap or cover, as shown. A rope, H, has one end attached to the cage A, similar to the attachment of the hoisting-rope, and it passes up over a pulley, I, thence down through the cap which covers the upper end of the upright tube F, and its opposite end is attached to the piston-head G in the tube, so that when the cage moves up or down the piston moves in a reverse direction inside the tube. The cap or cover of the cylinder has one or more holes made through it, and, if desired, a valve, *j*, can be arranged to regulate the outward flow of air through the holes. Usually a single hole is sufficient.

The lower end of the cylinder has also one or more holes made in it, and these holes I cover with a valve, *o*, which opens outward, but which is only closed by a sudden inrush of air through the holes. The valve *j*, analogous in construction with the valve *o* in the cylinder F, is of a cup-shape and fitted in a tubular seat, j^1, fastened to the head of said cylinder, which seat is provided with openings or ports j^2, opening into the cylinder, and through which air is admitted into the cylinder. The valve *j* has a stem, j^3, reaching up through an opening in the head of the cylinder to enable it to be raised or lowered with relation to the ports j^2, to control the amount of air passing through said ports in the cylinder. This piston moves downward in the tube when the cage moves upward, and when the cage moves downward the piston moves up. Now, if the hoisting-rope should break while the cage is being hoisted, the cage will drop until the upward movement of the piston G

compresses the air above it in the tube sufficiently to arrest the fall, after which the cage will be lowered only as fast as the compressed air escapes through the hole in the top of the cylinder. The space around the rope where it passes through the head of the tube affords sufficient egress for the air to drop the cage easily when the rope breaks. The sudden upward movement of the piston in the cylinder when the drop of the cage first comes upon it causes the inrush of air to close the valve at the bottom of the cylinder, so that a partial vacuum is created underneath the piston, which further assists in lowering the cage slowly. The size of the air-openings both at the top and bottom of the cylinder can be regulated so that the ordinary hoisting speed of the cage will allow the piston to move freely and follow the motion of the cage; but a sudden drop of the cage brings it into action by compressing the air above it and creating a vacuum underneath it.

The ends of the cylinder might be closed air-tight, if desired, in which case an air-passage will be made through the piston, so that the air can pass from one side of it to the other.

K is the hydraulic cylinder that operates the cage. L is the steam-pump, which takes the water from the tank M and forces it into the accumulator-chamber N; and Q is the valve-chamber, through which the water passes on its way from the accumulator-chamber to the hydraulic cylinder K.

My second improvement relates to an arrangement by which I avoid the necessity of using an air-chamber over the valve-chamber of the steam-pump to prevent the water from pounding on the valve. This pounding action is only partially relieved by an air-chamber as the back-flow of water from the accumulator, when the pump ceases acting, acts equally upon the valve and air-chamber.

In my arrangement *p* is the pipe through which the water is forced by the pump into the accumulator-chamber. To prevent the air which is carried into the accumulator with the water from being drawn into the hydraulic cylinder K, this pipe *p* enters the accumulator-chamber at a considerable distance above its lower end, while the pipe *t*, which conducts the water from the accumulator to the cylinder, enters the accumulator near its bottom. This arrangement enables me to connect the valve-chamber R of the pump with the accumulator-chamber by a pipe, *r*, which enters the accumulator-chamber below the pipe *p*. In the length of this pipe which enters the valve-chamber R there is located a valve, *s*, near its end, which opens into the valve-chamber at a point just below its valve, so that when the piston is moving the superior pressure in the valve-chamber closes this valve and the water is forced through the pipe *p* into the accumulator; but when the piston is at the end of its stroke and the water in the pipe *p* commences to react the superior pressure in the accumulator-chamber opens the valve *s* and forces the water through the pipe *r* into the valve-chamber, so that the reaction of the water in the pipe *p* is met and counteracted by the flow of water through the pipe *r*. This action occurs at the end of each stroke.

It will be seen that the superior pressure in the valve-chamber of the pump while the piston is moving will close the valve *s* against the lesser pressure of the water in the other arm of the pipe *r* from the accumulator, while, when the piston is at the end of its stroke, the superior pressure of the water in pipe *r* will open valve *s*, thus regularly working the valve and feeding the valve-chamber of the pump.

My third improvement relates to the construction of the valves and valve-seats in the valve-chamber Q. These valves slide vertically, being of the class known as "cut-off valves," and they are operated by rods or cords, which pass up through the cage or platform, so that by moving the rod or cord up or down the valves are opened and closed.

Heretofore the valves and valve-seats have been made circular, and as a consequence the valves were subjected to great wear, because, when partly open, only the upper portion had a bearing against the valve-seat, and the pressure of water against the lower part of the valves caused them to grind and cut on the seat, so that they soon began to leak and need repairs.

I make both the valve and valve-seat square or with parallel sides, so that both sides of the valve will bear against the seat throughout their length, no matter in what position it may be. The pressure on the valve is then received squarely on the seat and the wear is uniform, so that the valves will remain a long time without leaking or needing repairs.

I thus provide these important improvements in elevators. I render them safe and economical, and free them from shocks and jars.

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

1. The upright cylinder F, provided with the valved openings at both ends for the alternate admission and expulsion of air, in combination with the piston G, rope-connection H, pulley I, and elevator-cage A, all combined and arranged to operate substantially as and for the purpose described.

2. The combination, with the accumulator or reservoir and a steam-pump, of the pipes *p* and *r*, the pipe *r* having a valve, *s*, for relieving the valves of the pump of back action, as set forth.

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

PHILIP HINKLE. [L. S.]

Witnesses:
W. FLOYD DUCKETT,
W. F. CLARK.