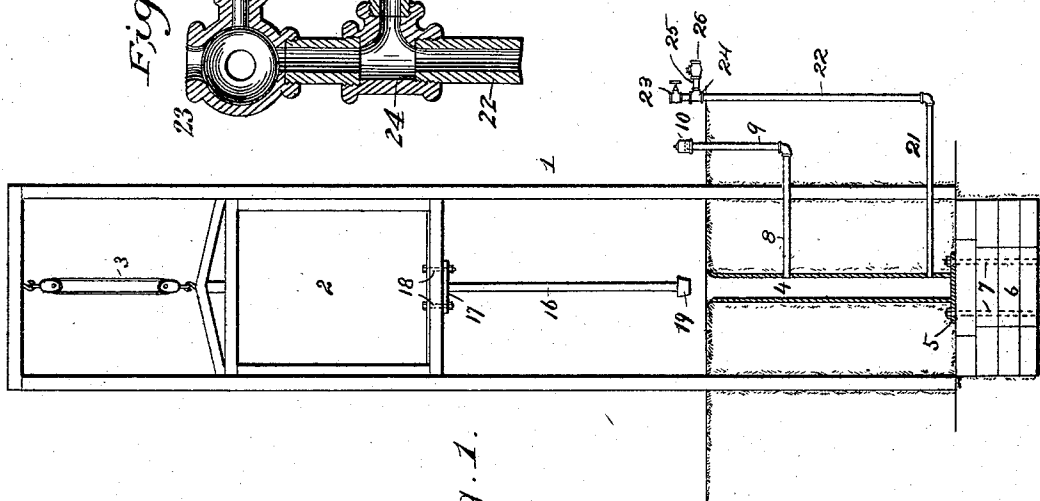
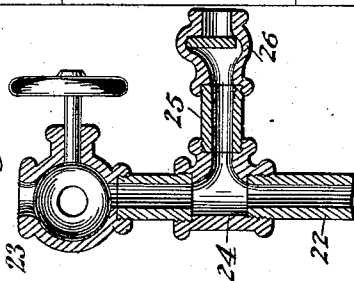
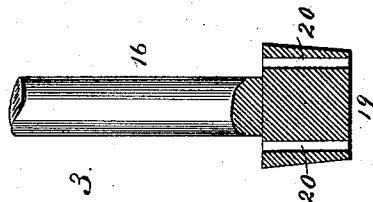
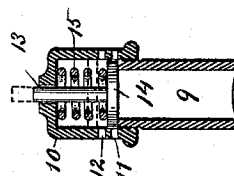
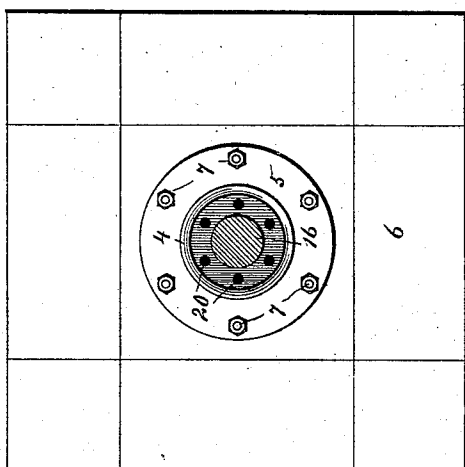


(No Model.)

C. A. ELLIS & E. S. MILLER.
PNEUMATIC CUSHION FOR ELEVATORS.

No. 572,531.

Patented Dec. 8, 1896.



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CHARLES A. ELLIS AND EDMUND S. MILLER, OF KANSAS CITY, KANSAS.

PNEUMATIC CUSHION FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 572,531, dated December 8, 1896.

Application filed February 17, 1896. Serial No. 579,627. (No model.)

To all whom it may concern:

Be it known that we, CHARLES A. ELLIS and EDMUND S. MILLER, of Kansas City, Wyandotte county, Kansas, have invented certain new and useful Improvements in Pneumatic Cushions for Elevators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part thereof.

Our invention relates to pneumatic cushions for elevators, and more particularly to a cushion which will bring the elevator-cage to a gradual stoppage no matter what the speed or velocity of descent may be.

A further object is to produce a pneumatic cushion which will not interfere in the slightest degree with the regular operation of the elevator and to produce apparatus embodying these advantages which are simple, strong, durable, and inexpensive of construction and which may be mounted or arranged in proper position with little difficulty or labor.

To these ends the invention consists in certain novel and peculiar features of construction and combinations of parts, as will be hereinafter described and claimed.

In order that the invention may be fully understood, we will proceed to describe it with reference to the accompanying drawings, in which—

Figure 1 represents an elevator-shaft provided with an elevator-cage and pneumatic cushion embodying our invention. Fig. 2 represents a horizontal section taken below the elevator-cage and on an enlarged scale. Fig. 3 represents in detail and in section the plunger carried by the elevator-cage. Fig. 4 represents a vertical section of the escape-valve, which is adapted to yield under great pressure and permit the escape of air. Fig. 5 is a detail sectional view enlarged.

In the said drawings, 1 designates an elevator-shaft; 2, an elevator car or cage therein; 3, a cable or cables by which it is suspended or supported, and 4 designates a vertical pneumatic tube which is mounted vertically and centrally of the shaft and extends downward from the level of the first floor, approximately, to a suitable depth. Its lower end is closed by the disk or flange 5, and it is held firmly and rigidly in position upon the foundation

structure 6 by means of the bolts 7, which extend through said foundation structure.

8 designates a horizontal pipe which communicates with the tube 4 above its middle, and 9 a vertical pipe which communicates with the outer end of the pipe 8 by means of an elbow or other suitable coupling.

10 designates a hollow cap which screws upon the upper end of the pipe 9, which upper end projects above the ground-floor at any convenient point where it is out of the way. Said cap is provided with two series of holes or apertures 11 and 12, one series being above the other, and the lower series 11 being just above the upper end of the pipe 9. The upper end of the cap is centrally perforated, as shown at 13, and engaging the same and guided therein is the stem of a disk valve 14, which normally occupies a plane coincident with the lower series of holes and thereby prevents the escape of air from the pipe 9 at its upper end. Said valve in such position rests squarely and firmly upon the upper end of said pipe and is held yieldingly thereat by means of the coil-spring 15, arranged spirally around its stem and bearing at its opposite ends against the valve and the upper end of the cap.

16 designates a rod or stem about the same length as the tube 4, which is arranged to depend vertically and centrally with relation to the elevator car or cage, it being provided at its upper end with a flange or base-plate 17, which is secured rigidly and firmly to the bottom of the elevator car or cage by means of bolts 18 or equivalent devices, and formed at or secured to the lower end of said rod is a head or piston 19, which is adapted to fit snugly within the tube 4 when the car or cage is at the lower end of the shaft, and for convenience and to insure the piston properly entering said tube the latter is preferably flared outwardly at its upper end or mouth. This piston is provided with a series of vertical air-passages 20.

21 designates a pipe communicating at its opposite ends with the lower end of the tube 4 and the pipe 22, which latter at its upper end is provided with a globe valve 23, and below the same with a T-coupling 24, which carries a branch pipe 25, provided with a

check-valve 26, adapted to close tightly with the air-pressure caused by the descent of the plunger within the tube and to open with the opposite or upward movement of the piston, so that air is drawn into the lower end of the tube *via* the pipes 25, 22, and 21. It also enters the same by way of the passages 20 of the plunger 19 when provided with such.

In practical operation as the car travels up and down within the shaft under the control of the actuating machinery it is practically unaffected by the pneumatic-cushion apparatus, owing to the fact that its descent is comparatively slow, and consequently when the piston enters and moves downward to the bottom of the tube 4 the air is compressed within said tube so slowly that it has ample time to escape upwardly through the passages 20 of the piston without affecting the position of the spring-actuating valve 14 in the slightest degree, and as it moves upward air enters the tube below the piston, and by giving it free vent in this manner prevents any suctional resistance to the upward movement of the plunger, which would unavoidably follow if there was no means of admitting air to the bottom of the tube when the plunger started to rise. When it descends with great velocity or speed, however, because of the breakage of the supporting mechanism or other cause, the piston moves downward in the tube with such rapidity that only a comparatively small volume of air can escape upwardly through the openings 20, and the great air-pressure thus generated forces the valve 14 upward from its seat against the resistance of the spring 15, and a large volume of air escapes by way of the holes or perforations 11, or 11 and 12. Thus it will be readily understood that as the air is held tightly compressed by the downwardly-moving piston the car or cage is brought to a gradual stop positive and reliably and is not arrested as suddenly as it would be if no provision were made for the escape of air, it being also clear that if the passages 20 alone were provided for this purpose the air could not escape with sufficient rapidity to prevent more or less concussion as the car suddenly stopped. After the speed of the downwardly-moving plunger is thus yieldingly checked it moves downward to the bottom of the tube by the further compression of the air within the tube and also

by reason of the passages 20, through which a small volume of air escapes and permits the elevator car or cage to descend to the lowest landing.

It is to be understood, of course, that the substitution of mechanical equivalents for parts of this apparatus, such, for instance, as the use of a weighted valve (like the safety-valves on steam-boilers) instead of our spring-actuated valve, may be made without departing from the spirit and scope of our invention; but the structure shown is preferred, because it is simpler, more compact, and less expensive of manufacture.

Having thus described the invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In combination with an elevator car or cage, a piston depending vertically and centrally therefrom, a pneumatic tube arranged to receive the same below the lower landing or floor, a pipe communicating with the tube above its middle, a perforated cap for the upper end of said pipe, and a spring-actuated valve within said cap, and seated normally upon the upper end of said pipe, substantially as shown and described.

2. In combination with an elevator car or cage, a vertically-perforated piston depending vertically and centrally from and carried by said car or cage, a pneumatic tube having its lower end closed and its upper end open, and arranged with its upper end about coincident with the bottom floor or landing of the building wherein the elevator is located, and bolted to a suitable foundation at its lower end, a pipe communicating with said tube above its middle, a perforated cap upon its upper end, a spring-actuated valve within said cap and normally seated to prevent the escape of air from said pipe, a second pipe communicating with the lower end of said tube and with the outside air, and provided with a globe-valve and a check-valve, all arranged substantially as and for the purpose set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

CHARLES A. ELLIS.
EDMUND S. MILLER.

Witnesses:

J. L. CARLISLE,
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