No. 632,347. Patented Sept. 5, 1899.

J. G. GRACEY.

AUTOMATIC STOP FOR ELEVATORS.

(Application filed May 8, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

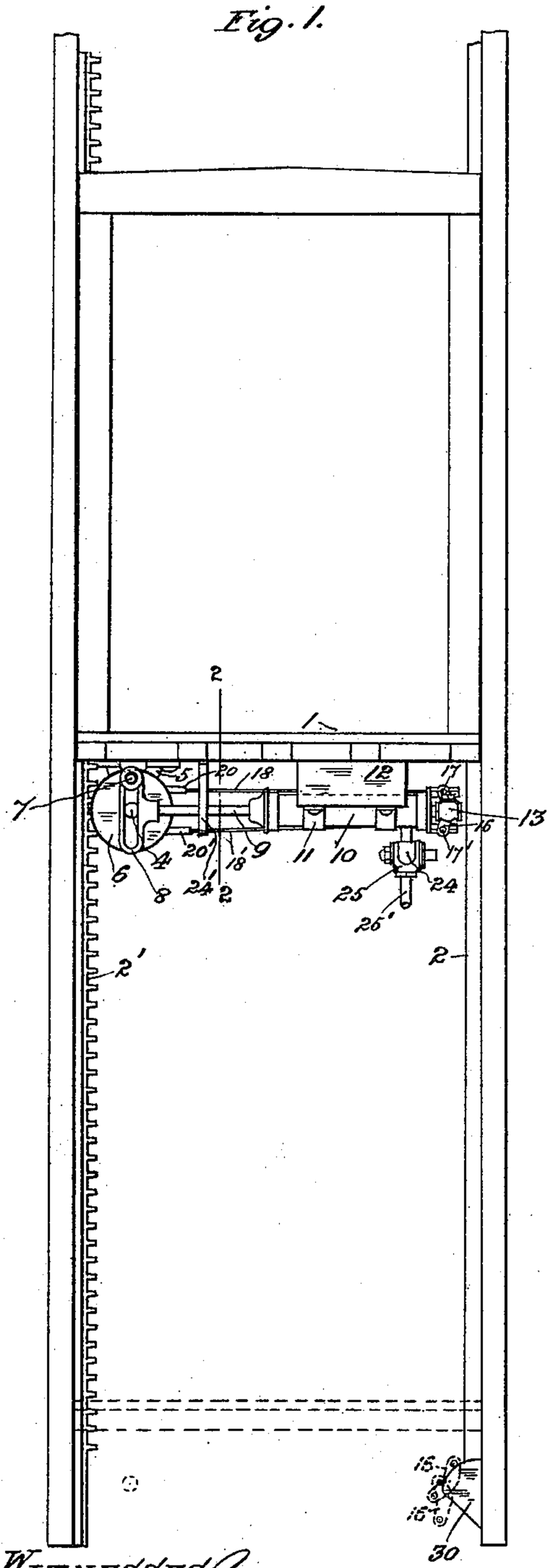

Fig. 2.

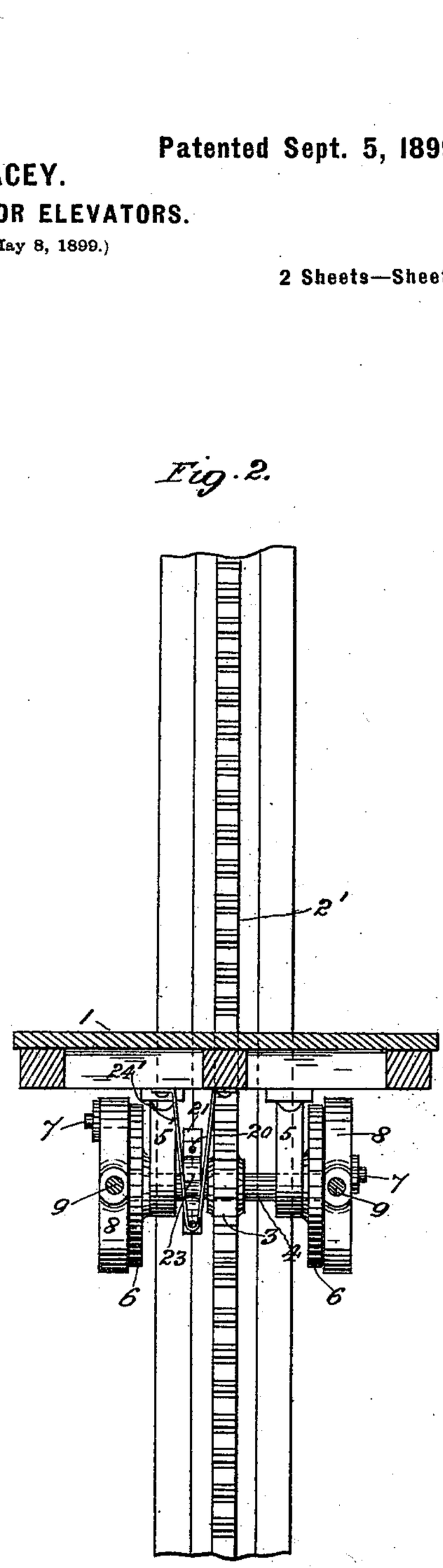

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Fig. 3.

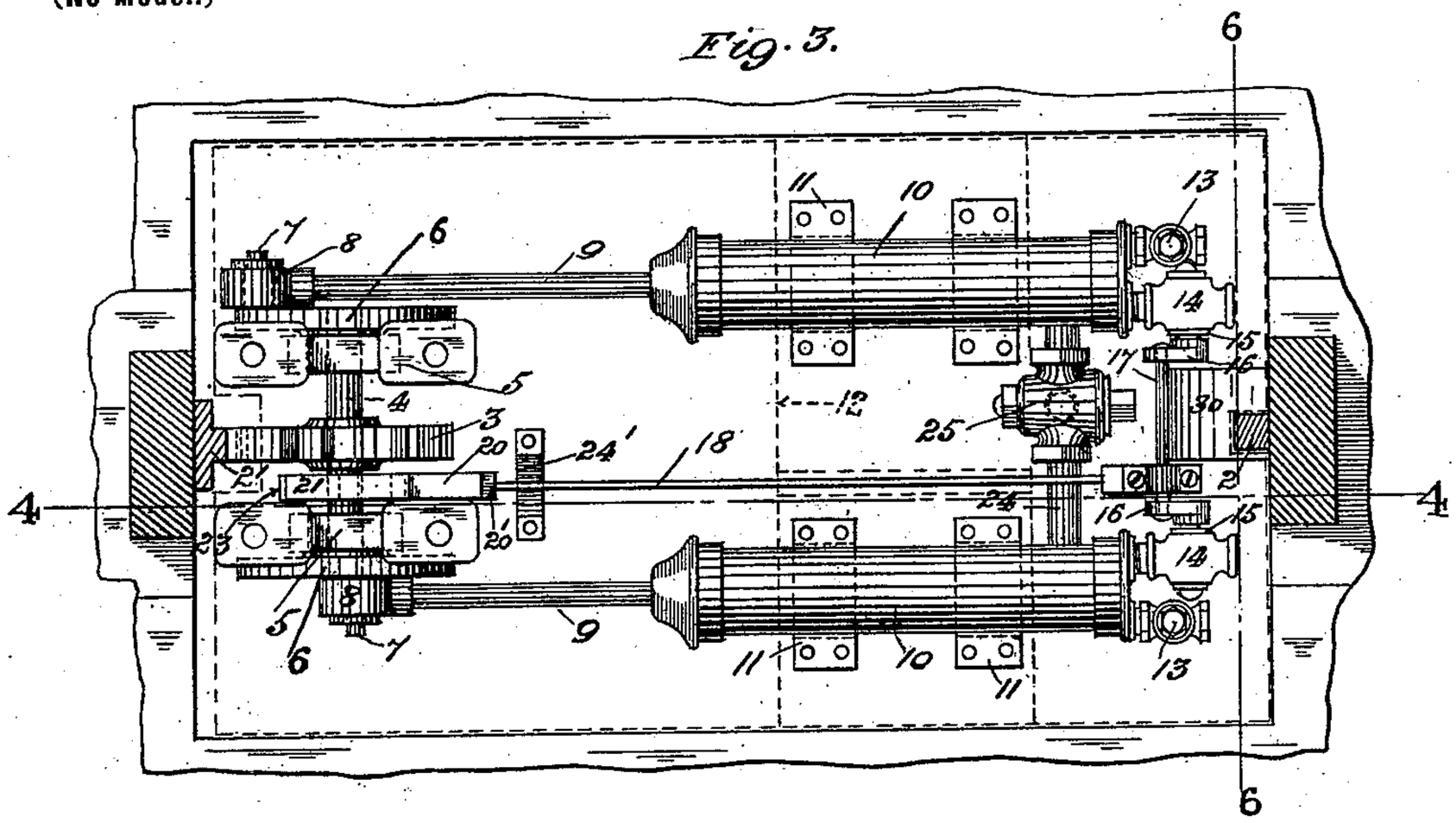


Fig. 4.

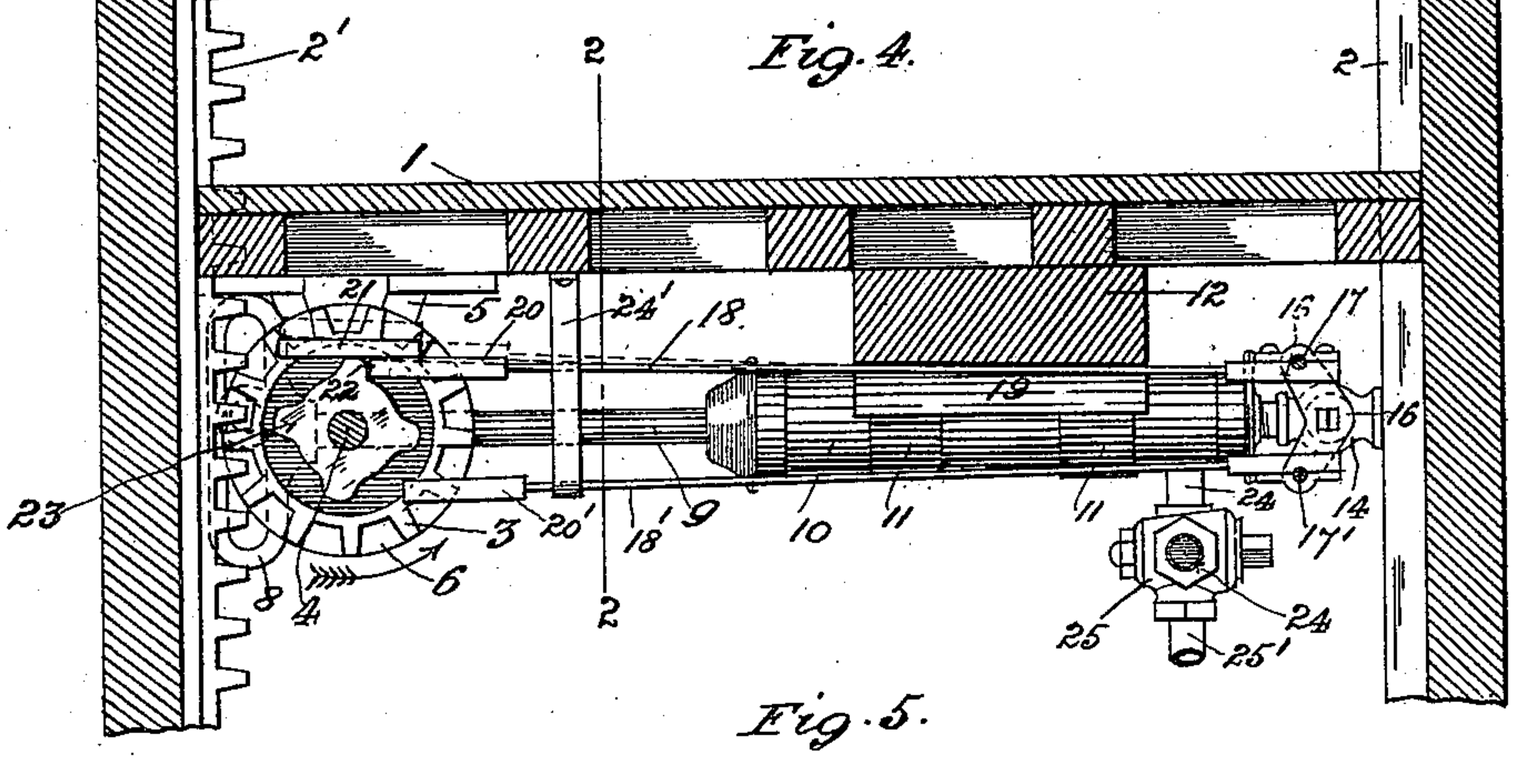


Fig. 5.

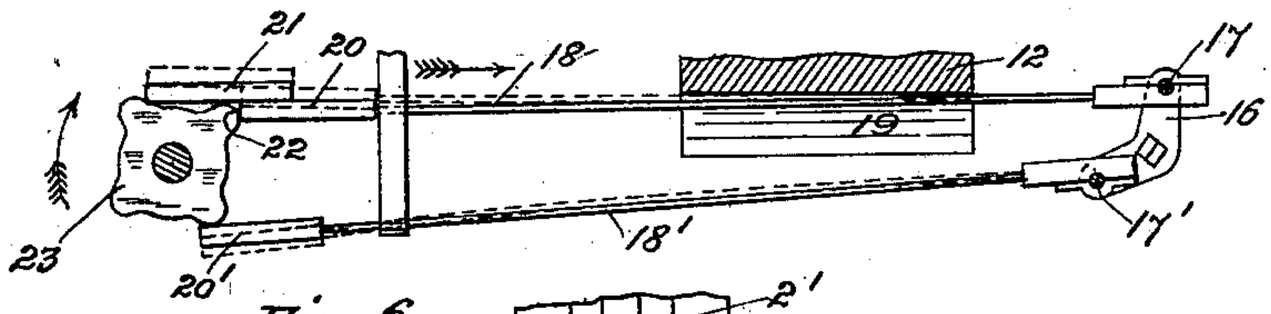
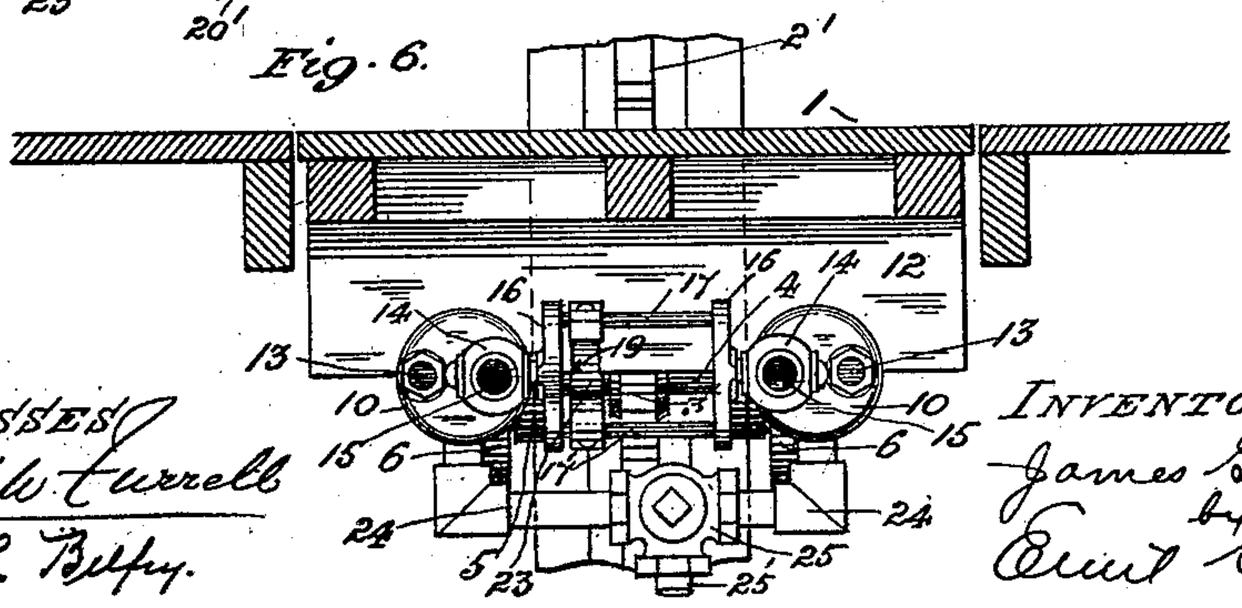


Fig. 6.



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UNITED STATES PATENT OFFICE.

JAMES G. GRACEY, OF ST. LOUIS, MISSOURI, ASSIGNOR OF ONE-HALF TO ALFRED GFELLER, OF SAME PLACE.

AUTOMATIC STOP FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 632,347, dated September 5, 1899.

Application filed May 8, 1899. Serial No. 715,987. (No model.)

To all whom it may concern:

Be it known that I, JAMES G. GRACEY, a citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Automatic Stops for Elevators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in automatic stops for elevators; and it consists in the novel arrangement and combination of parts more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is an elevation of a portion of an elevator-shaft, showing my invention in side elevation. Fig. 2 is a transverse vertical section on line 2 2 of Fig. 1. Fig. 3 is a top plan view of the pump mechanism, the platform of the elevator and the mounting-block by which the pump-cylinders are carried being shown dotted and the vertical side timbers of the elevator-shaft being shown in section. Fig. 4 is a longitudinal section through the several parts shown in Fig. 3, the platform of the cage, however, being in place, the section being on line 4 4 of Fig. 3, this view showing, as does Fig. 3, the rock-frame tilted to a position corresponding to the open position of the air-cocks controlling the discharge-nozzles of the pump-cylinders, the cage being in the act of ascending. Fig. 5 is a view corresponding to Fig. 4, the cage and shaft timbers being omitted, however, but showing the rock-frame tilted to a position corresponding to the closed position of the air-cocks or to that position which is assumed by the parts when the cage is descending; and Fig. 6 is a section on line 6 6 of Fig. 3.

The object of my present invention is to provide a passenger or freight elevator with a pneumatic automatic stop mechanism which will positively arrest the drop of the cage should the cables supporting it break or give way and which will regulate the descent of the elevator under ordinary conditions, the maximum speed or rapidity of such descent being determined at the outset by the engineer.

In detail the present device may be described as follows:

Referring to the drawings, 1 represents the floor of any prevailing type of elevator-cage, the latter being guided within the shaft by means of tracks or ways 2, disposed along the side vertical walls of the shaft. In the present device one of the tracks is in the form of a rack-bar 2′, the teeth of which mesh with a driving-pinion 3, carried centrally along a transverse shaft 4, mounted in bearings or hangers 5 along the under surface of the floor, the outer ends of the shaft having secured thereto the crank-disks (or arms) 6. The latter are provided with roller-bearing crank-pins 7, which operate within the slotted heads 8 of the outer terminals of the piston-rods 9, disposed parallel to the front and rear walls of the cage, the pistons of the rods operating within the cylinders 10 of the single-acting air-pumps thus formed. The cylinders are secured by means of straps 11 to a bearing or mounting block 12 beneath the floor, the heads of the cylinders being provided with an air-inlet valve 13, as is common in air-pumps of the character here referred to.

Disposed at the base of the discharge-nozzle 14 of each cylinder is an oscillating air-cock 15, the same being of the ordinary rock-valve type with a single transverse passage or opening and well known in the art, the stems of the respective cocks constituting the pivots for a rock-frame interposed between the discharge ends of the two cylinders. The rock-frame is composed of the terminal arms or levers 16, connected at opposite ends by transverse cylindrical rods 17 17′, respectively. Embracing loosely the upper rod 17 is one end of a shifting rod 18, guided in its movements along the base of a recess 19 formed in the bearing-block 12, the opposite end of the shifting rod being provided with a head 20, to the upper surface of which is secured a bearing-plate 21, extending beyond the head, thereby virtually forming a shoulder 22 between the end of the head and the under surface of the bearing-plate.

Mounted adjacent to the pinion 3 and carried by the shaft 4 and in line with the shift-

ing rod 18 is what may be termed a "sprocket-disk" 23, any tooth of which, as the cage is descending, is adapted, with the rotation of the shaft 4, to strike against the shoulder 22, (the shoulder being in reality the butt-end of the head 20,) pushing the shifting rod in the direction shown by the arrow in Fig. 5 and rocking the frame 16 17 in the same direction, and hence rocking the air-cocks 15 to a closed position, and thus preventing the sudden discharge of the air accumulated in front of the pistons. It is apparent that were the cage heavily loaded or its descent too sudden in case of the breakage of the supporting-cables the walls of the cylinders might burst if not sufficiently strong to resist the pressure of air thus accumulated within them, and to prevent this accident I connect the discharge ends of the cylinders by a pipe 24, provided with an air-regulating discharge-cock 25, having a discharge-nozzle 25′, by which the rapidity of discharge of the air which is being accumulated by the pumps may be regulated, thereby regulating the speed of descent of the cage whether the latter is descending under normal conditions or whether it is descending upon the breaking of the supporting-cables. It is of course obvious that were the walls of the cylinders sufficiently strong to resist the accumulated air-pressure within them and no provision were made for the gradual escape of the compressed air, as herein indicated, the elevator would simply come to a dead stop the moment the air-pressure was sufficient to prevent the reciprocations of the pistons, or, what is the same thing, sufficient to prevent the rotation of the pinion 3 along the rack-bar 2′. After the shifting rod 18 has been pushed to close the air-cocks 15, as just described, the bearing-plate 21, by which the said rod is supported at that end, simply rides over the series of teeth with which the sprocket-disk 23 is provided. (See dotted position in Fig. 5.)

With the ascent of the cage it is important of course that no resistance be offered to the free and uninterrupted operation of the pumps, and hence it is essential that the cocks 15 be open. The opening of these cocks at the proper moment is accomplished as follows: Embracing loosely the lower rod 17′ of the rock-frame is one end of a second shifting rod 18′, passing over and guided by a strap 24′, depending from the floor of the cage, and the opposite end of said shifting rod terminating in a head 20′, adapted to be struck by the teeth of the sprocket-disk as the same begins to revolve in the opposite direction with the upward travel of the cage. The upward travel of the cage necessarily reverses the direction of rotation of the pinion 3, and hence that of the shaft on which the pinion and sprocket-disk are mounted. By striking the head 20′ the rock-frame is oscillated in the opposite direction, the cocks 15 are opened, and the head 20 of the shifting rod 18 is again restored to a position to be struck by the teeth of the sprocket-disk when the cage begins to descend. The rods 18 18′ while sufficiently rigid to effect the rocking of the frame 16 17, as indicated, are at the same time sufficiently yielding to permit the uninterrupted travel in the proper direction of the teeth of the sprocket-disk over the heads 20 20′ and bearing-plate 21 after the said frame has been rocked to either one of its extreme positions. Thus, as seen by dotted lines in Fig. 5, when the frame 16 17 has been rocked to close the cocks 15 15 the teeth of the sprocket-disk ride freely over the yielding head 20′ of the rod 18′, the latter acting in the nature of a spring-pawl; but it is apparent that the moment the disk 23 reverses its rotation it will bear against the butt-end of the head 20′, shifting the rod 18′ in a reverse direction.

It is of course apparent that the cocks 15 15 can be rocked to an open position only with the upward movement of the cage—that is to say, a movement which will reverse the direction of rotation of the pinion 3 and sprocket-disk 23. The frame 16 17, by which the cocks 15 15 are controlled, can, however, be reversed automatically by the downward movement of the cage just before the latter has made its full descent. This is accomplished as follows:

Located at the bottom of the shaft is a wedge-shaped block 30, the upper inclined (and preferably curved) surface of which is adapted to be struck by the rod 17 as the cage is descending. In thus striking the block the rod 17 rides along the incline and the frame 16 17 is tilted sufficiently to rock the cocks 15 to an open position, it being understood that the teeth of the rack-bar 2′ are discontinued at a point opposite the block 30 (see Fig. 1) in order to permit of the free rotation of the pinion 3 in the opposite direction under the sudden reversal of the rock-frame, for it is obvious that were the teeth of the rack-bar 2′ continued to the full depth thereof the engagement of the pinion 3 with said teeth would prevent the rocking of the frame 16 17 in the reverse direction, as with the descent of the cage the direction of rotation of the pinion would be such as to prevent the rocking of the frame in a reverse direction.

While, as above stated, the reversal of the rock-frame 16 17 can be effected by the ascent of the elevator, it is preferably accomplished by the block 30 during the descent of the cage, as a sudden reversal of the rock-frame under the circumstances effects an almost immediate release of the air confined within the cylinders, thereby reducing to a minimum the resistance to be overceme in starting the elevator in an upward direction.

It is apparent that many changes might be made in the details without departing from the spirit of my invention. For example, I could substitute a different form of air-pump, or reduce or increase the number of cylinders,

or provide different means for mounting the mechanism, all of which is obvious to a skilled mechanic.

Having described my invention, what I claim is—

1. In a stop mechanism for elevators, a suitable air pump or pumps, discharge-nozzles leading from the cylinders thereof, cocks controlling the efflux of air from said nozzles, means for closing said cocks and compressing the air upon the descent of the elevator, and thereby arresting the sudden drop of the cage in case of accident, substantially as set forth.

2. In a stop mechanism for elevators, a suitable air pump or pumps, discharge-nozzles leading from the cylinders thereof, cocks controlling the discharge of air through said nozzles, a drive-shaft for the pumps, a rack-bar disposed along the vertical wall of the elevator-shaft, a pinion carried by the drive-shaft of the pumps and adapted to mesh with the teeth of the rack-bar, and intermediate connections between the drive-shaft and cocks for closing the latter upon the descent of the elevator, and opening of the cocks upon the ascent of the elevator or upon the reverse rotation of the pinion, the parts operating substantially as and for the purpose set forth.

3. A stop mechanism for elevators comprising two air-pumps having parallel-disposed cylinders and mounted underneath the floor of the cage, a drive-shaft for reciprocating the pistons of the cylinders, a pinion carried by the drive-shaft, a rack-bar forming one of the guides or tracks for the cage, the teeth of said rack-bar meshing with the pinion, discharge-nozzles leading from the cylinders of the pumps, oscillating air-discharge cocks mounted on the nozzles, a rock-frame connecting the stems of the cocks, a sprocket-disk mounted on the drive-shaft, a shifting rod having one end loosely embracing the upper portion of the rock-frame, the opposite end or head of the said rod being adapted to be struck by the teeth of the sprocket-disk upon rotation of the pinion in one direction, a bearing-plate carried by the head of the shifting rod and adapted to ride over the sprocket-disk, a second shifting rod having one end loosely embracing the lower portion of the rock-frame and having a head adapted to be struck by the teeth of the sprocket-disk upon rotation thereof and the pinion in the opposite direction, whereby the cocks are closed upon the descent of the elevator, and opened with the ascent thereof, and an air-cock for regulating the escape of air compressed during the descent of the elevator, and hence regulating the rapidity of the descent of said elevator, substantially as set forth.

4. In a stop mechanism for elevators, an air pump or pumps, a rock-frame, air-cocks actuated by the frame, a rack-bar disposed along the vertical wall of the elevator-shaft, a pinion carried by the drive-shaft of the pumps, and meshing with the rack-bar, intermediate connections between the drive-shaft and rock-frame for rocking the latter in one direction during the descent of the elevator, and a block located at the bottom of the elevator-shaft and adapted to be struck by the rock-frame during the descent of the elevator whereby the frame is rocked in the opposite direction, the teeth of the rack-bar being discontinued at a point opposite the block in order to permit the reverse rotation of the pinion with the rocking of the frame in the opposite direction, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES G. GRACEY.

Witnesses:

EMIL STAREK,

GEORGE L. BELFRY.