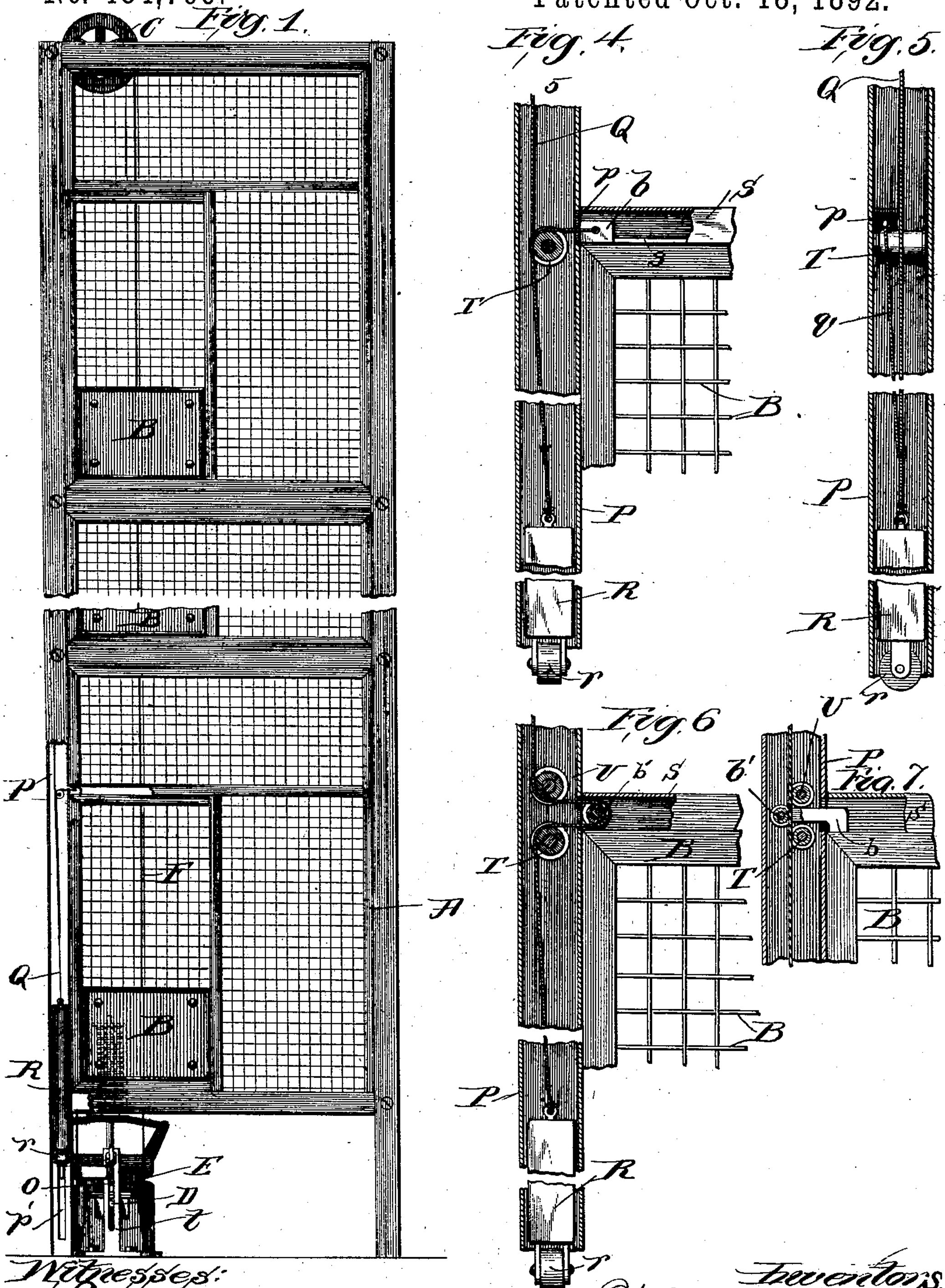
(No Model.) 2 Sheets—Sheet 1.

W. J. ROCHFORD & E. W. KEMPTER.

ELEVATOR.

No. 484,766. Patented Oct. 18, 1892.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

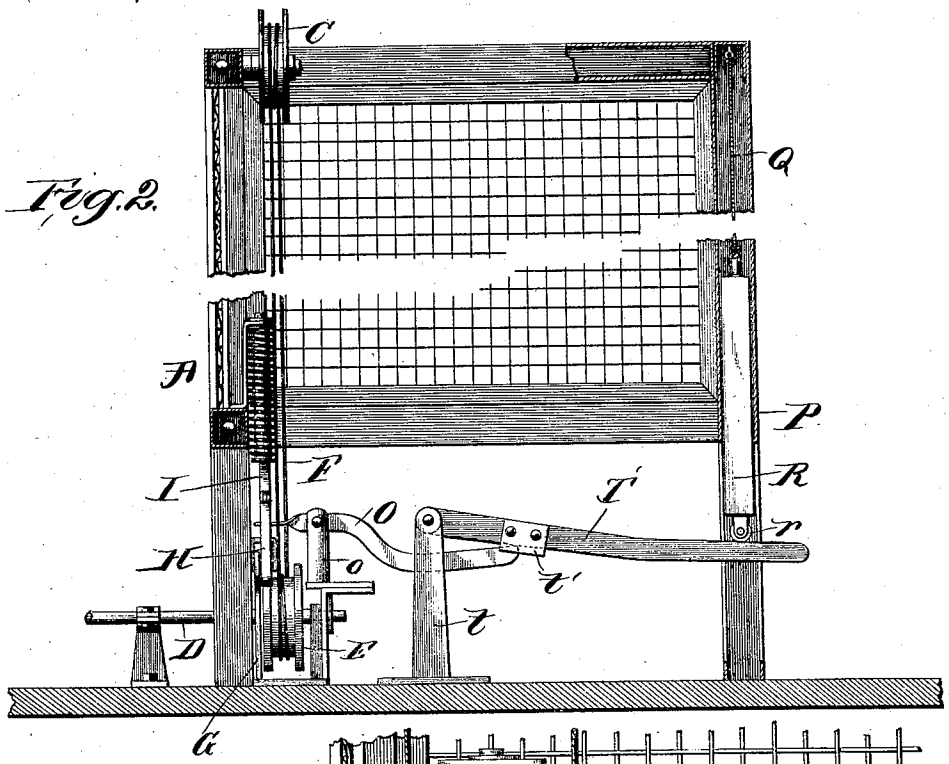
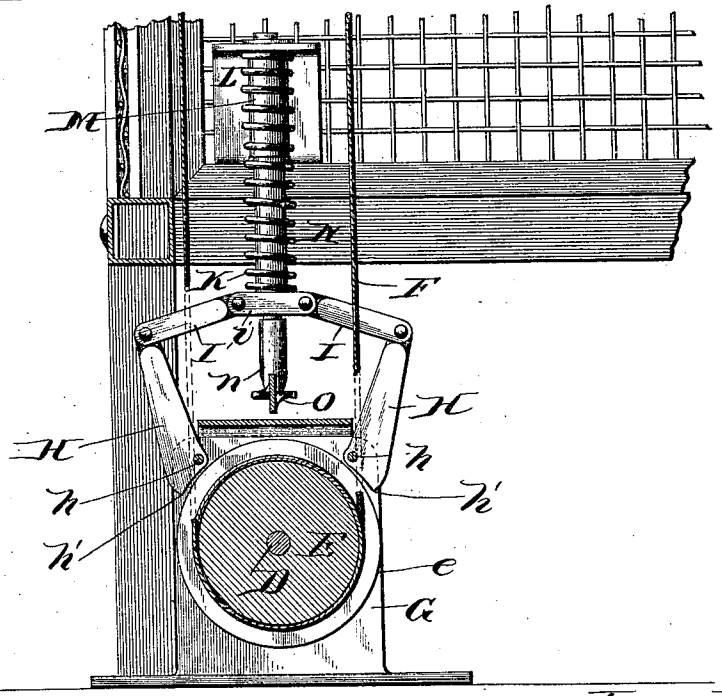


Fig. 3.



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UNITED STATES PATENT OFFICE.

WALTER J. ROCHFORD AND ERNEST W. KEMPTER, OF CHICAGO, ILLINOIS.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 484,766, dated October 18, 1892.

Application filed February 1, 1892. Serial No. 419,970. (No model.)

To all whom it may concern:

Be it known that we, WALTER J. ROCHFORD and ERNEST W. KEMPTER, citizens of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Elevators, of which the following, in connection with the accompanying drawings, is a full, clear, and exact specification.

Our invention relates to improvements in controlling mechanism for elevators, and more particularly to that class of such devices employed for preventing the operator from accidentally or purposely starting the car either up or down while any of the doors of the elevator-shaft are open, thus avoiding the possibility of persons becoming injured by being caught between the moving elevator-car and the casement or sill of the door, it being well understood that a large percentage of the casualties incident to the use of elevators are due to this cause.

The object of our invention, therefore, is to provide improved means for preventing the movement of the car while any of the doors are open and which shall be very simple of construction, easy of and automatic in its operation, and applicable alike to all styles of elevators.

Our invention consists in certain features of novelty in the construction and combination of parts by which the said object and certain other objects hereinafter described are attained, and which will first be fully described with reference to the accompanying drawings, and then particularly pointed out in the claims.

In the said drawings, Figure 1 is a side elevation of an elevator-shaft having our improvements applied thereto, portions being broken away to disclose the interior mechanism and the car being omitted for the sake of simplicity. Fig. 2 is a similar view, on a larger scale, but looking from the side at right angles to that presented in Fig. 1, showing the upper and lower portions of the shaft, the intermediate stories being broken away. Fig. 3 is a detail view, on a larger scale, more particularly illustrating the brake and its retracting mechanism, as hereinafter described. Fig. 4 is a detail vertical section of the weight and cable box or casing, showing interior parts, as hereinafter described. Fig. 5 is a similar sectional view taken on the line 5 5, Fig. 4. Fig. 6 is a sectional view similar to Fig. 4, illustrating the modification of the manner of connecting the weight-cable to the doors; and Fig. 7 is a further modification of the same.

In the drawings, wherein like signs of reference refer to like parts throughout the several views, A indicates the elevator-shaft, which may be of the usual construction, provided at each story with the ordinary sliding door B, and at its upper and lower ends with the valve-rope sheave or pulley C and the valve-actuating shaft D, respectively.

In hydraulic elevators it is usual to provide the valve-shaft D with a pulley or drum, such as E, around which valve-rope F is wound and passes upward over its sheave C at the top of the elevator-shaft; but in other forms of elevators—such, for instance, as the steam-elevator—the drum E is not ordinarily employed, the rope F in such case being connected to the lever or some other similar device for actuating the shaft D, which latter, however, is invariably employed in one form or another. Therefore for the sake of brevity I will term the shaft D the "power-controlling shaft," which term will be understood to include any form of shaft or device through the medium of which the power for raising the elevator is controlled by means of a rope, such as F. Hence in applying our improvements to the forms of elevators not already provided with the drum E it is simply necessary to add such drum to the shaft D and pass the rope F around it in the manner shown in the drawings or any other suitable way.

Pivoted to the bracket or standard G, in which the shaft D is journaled, is a brake adapted to arrest the movement of the drum E, so as to prevent the rotation of the shaft D and the consequent application or shutting off of the power through the medium of the rope F. This brake preferably consists of two brake-shoes H, pivoted to the standard G at the points *h*, adapted to impinge one of the flanges *e* of the drum when the brake-shoes are oscillated or rocked away from each other upon their pivots. Each of these brake-shoes is provided, as more clearly shown in Fig. 3, with an elongated arm, and these arms are connected together by means of a toggle, which

consists, preferably, of the two links I, pivoted, respectively, at their outer ends to the arms of the shoes H and at their inner ends to the perforated head or block *i*, so that when such block is forced downward, straightening the toggle, the arms of the brake-shoes will be forced asunder and the noses *h'* of such shoes caused to impinge the drum with great force. The brake-shoes are held normally in engagement with the drum, and this is accomplished, preferably, by means of a coiled spring K, which bears between the block *i* and a bracket L, secured to the elevator shaft or frame in any suitable manner, and passing upward through this spring K is a telescopic shaft or pin whose upper end or portion M is rigidly secured to the bracket L, while its lower portion or end N is connected or secured in any suitable manner to the block *i*, and is provided with a pendent portion *n*, to which latter is pivoted the short arm of a lever O; but since the purpose of the telescopic shaft is simply to confine the spring to its proper location and permit the toggle to be bent upward for releasing the brake-shoes it is obvious that such shaft or pin might be formed in one piece and allowed to slide upward through an opening or socket in the bracket L, and that the lever O might be secured directly to the block *i* or to the telescopic shaft or pin proper, both of which modifications will be readily understood without further elaboration; but the construction shown is preferable, because the shaft M N is thereby rendered more rigid and requires less room for its operation.

Formed, preferably, in the frame or one corner of the elevator-shaft is a weight or cable box P, which extends throughout the height of such shaft, and is preferably in the corner adjacent to the edge or side of the door or doors bearing the latch or lock. In the upper end of this weight and cable box or casing P is secured the upper end of the weight-cable Q, which extends downward to a point near the lower end of the shaft and is there provided with a weight R, which is of sufficient size or specific gravity to cause the closing of any of the elevator-doors B. The casement or frame S above each of the doors B is preferably hollow and provided on its under side with a longitudinal slot *s*, through which passes and slides a lug *b*, which is formed on or otherwise secured to that corner of the door which is adjacent to the casing or box P, and to each of these lugs *b* is secured one end of a branch cable *q*, which passes over an idle pulley or roller T, suitably journaled in the box P, and has its other or lower end spliced, tied, or otherwise connected to the main cable Q, the side of the box P being provided with openings *p* for the passage of each of the branch cables *q*, and it being understood that such cables *q* should be at least as long as the width of the door. Thus it will be seen that whenever a door is opened in any story of the building the cable Q will be drawn upward by the branch cable *q*, and the weight R will consequently be lifted a distance equal to the movement of the door, and that when the door is released it will be automatically closed by the superior gravity of such weight R.

In order to govern the movement of the brake-shoes H by the movement of the doors B, we communicate the movement of the weight R to the lever O, so that when such weight descends in the act of closing the door the lever O will compress the spring K and release the brake-shoes, thus permitting the power-controlling shaft D to be actuated through the medium of the rope F. In order, however, that the spring K may be stout, so as to produce by the aid of the leverage afforded by the toggles I the requisite pressure upon the brake-shoes without the necessity of employing an excessively-large weight R, which would prove disastrous to the cable Q and render the opening of the doors B very laborious, we communicate the movement of the weight R to the brake-shoes and spring K through the intermediary of a compound ever, of which the lever O, a lever of the first order, is one member, while a lever T' of the second order is a second member. The lever T' is pivoted or fulcrumed in a standard or upright *t*, and its power end passes through the path or line of movement of the weight R, preferably through a vertical slot *p'* in the box P, so as to constitute a guide for this end of the lever. The lever O is pivoted or fulcrumed in a suitable standard or bracket *o*, and its power end or long arm passes through the standard *t*, so as to be guided thereby, and supports the lever T' by impinging the under side thereof between two guide-plates *t'*. Thus it will be seen that the gravity of the weight R is sufficient to overcome the inertia of the spring K, and yet offer but little resistance to the opening of the doors B.

In order to prevent the rotation of the weight R and the consequent twisting of the cables Q and *q*, we prefer to make the box P at its lower end—at least where the weight is located—non-circular in cross-section and to also form the weight of similar contour. As shown in the drawings, it is square or rectangular. The lower end of the weight R is also provided with an antifriction-roller *r*, which is suitably journaled in two depending ears formed on the lower end of the weight, so as to reduce the friction between the end of the lever T and the weight to a minimum. With an apparatus thus constructed it will be seen that so long as the weight R is in contact with the lever T' the brake-shoes *h'* will be held aloof from the periphery of the cable-drum E; but as soon as any of the doors throughout the height of the elevator-shaft are opened the said weight will be raised from the lever T' through the connections already described, and the spring K, through the medium of the arms or levers H, will force the brake-shoes firmly against the cable-drum, and thus render it impossible to turn such drum through

the medium of the rope or cable F, and hence the attendant will be unable to start the car until all of the doors are closed.

If desired, the branch cables *q* may be done away with and the main cable Q passed under an idler U, arranged a little above the idler T, and thence passed around a pulley *b'*, journaled on the lug *b* on the corner of the door, the cable then passing over the idler T, as before, whereby when the door is opened a loop of the cable will be drawn into the hollow portion S of the casement and the weight accordingly elevated. This construction, however, multiplies the resistance of the weight R upon the door and might be considered inferior to the preferred form before described for that reason.

As a modification of the form shown in Fig. 6, the lug *b* may be extended into the box or casing P through the opening *p* and between the idlers T U, so that the pulley *b'* may be journaled in its end in such a position as to allow the main cable to hang vertically between the three pulleys, thus avoiding the necessity of overcoming the friction in opening a door, which is entailed by the cable running between the idlers T U and around the pulley *b'* on all the doors below the door being opened.

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

1. In an elevator, the combination, with the shaft having doors, of a cable suspended in said shaft and connected to each of said doors, a weight secured to said cable, a power-controlling shaft, a drum on said power-controlling shaft, means for rotating said drum from the elevator-car, a brake for locking said drum against rotation, and a lever actuated by said weight for releasing said brake, substantially as set forth.

2. In an elevator, the combination, with the shaft having doors, of a cable suspended in said shaft and connected to each of said doors, a weight secured to said cable, the power-controlling shaft, a brake for locking said power-controlling shaft against rotation, means for actuating said power-controlling shaft from the elevator-car, and a compound lever for releasing said brake arranged in the line of movement of said weight, substantially as set forth.

3. In an elevator, the combination, with the elevator-shaft having doors, of a cable suspended in said shaft and connected to each of said doors, a weight secured to said cable, the power-controlling shaft, means for actuating said power-controlling shaft from the elevator-car, a brake for locking said power-controlling shaft against rotation, toggles for actuating said brake, a spring for actuating said toggles to hold the brake normally in engagement, and a compound lever for releasing said brake arranged in the line of movement of said weight, substantially as set forth.

4. In an elevator, the combination, with the elevator-shaft having doors, of a weight-box, a cable suspended in said box and connected with each of said doors, a weight secured to said cable, the power-controlling shaft, a brake for locking said shaft against rotation, and a compound lever for releasing said brake and projecting through said weight-box in the line of movement of said weight, substantially as set forth.

5. In an elevator, the combination, with the elevator-shaft having doors, of a suspended cable, branch cables connecting said doors with said suspended cable, a weight secured to said suspended cable, the power-controlling shaft, a brake for locking said shaft, and a lever for disengaging said brake arranged in the line of movement of said weight, substantially as set forth.

6. In an elevator, the combination, with the elevator-shaft having doors, of a suspended cable, branch cables connecting said first cable with said doors, pulleys over which said branch cables pass, a weight secured to said first cable, the power-controlling shaft, a brake for locking said shaft, and a lever for disengaging said brake arranged in the line of movement of said weight, substantially as set forth.

7. In an elevator, the combination, with the elevator-shaft having doors, of a non-circular weight-box, a cable suspended in said box and being connected with each of said doors, a non-circular weight secured to said cable in said box, the power-controlling shaft, and a brake for locking said shaft adapted to be disengaged by the movement of said weight, substantially as set forth.

8. In an elevator, the combination, with the elevator-shaft having doors, of the box P, a cable suspended in said box, the hollow slotted frames S, lugs on said doors, projecting into said hollow frames S, branch cables connecting said lugs with said first cable, pulleys over which said branch cables pass, a weight secured to said first cable, the power-controlling shaft, and a brake for locking said shaft adapted to be disengaged by movement of said weight, substantially as set forth.

9. In an elevator, the combination, with the elevator-shaft having doors, of a weight for holding said doors closed, the power-controlling shaft, a drum on said shaft, the rope F, passing around said drum, brake-shoes arranged to impinge said drum, toggles for actuating said brake-shoes, a spring for forcing said toggles in one direction, and a compound lever for forcing said toggles in an opposite direction arranged in the line of movement of said weight, substantially as set forth.

10. In an elevator, the combination, with the power-controlling shaft having a drum thereon, of the pivoted brake-shoes H, having elongated arms arranged to impinge said drum, toggles connecting said arms, the fixed bracket L, the telescopic pin or shaft having one end secured to said bracket and its other end to said toggles, a spring sleeved on said

telescopic shaft for forcing said brake-shoes into engagement, and means for disengaging said brake-shoes, substantially as set forth.

11. In an elevator, the combination, with the elevator-shaft having doors, of a weight connected with said doors for closing them, an antifriction-roller on said weight, means for preventing the rotation of said weight, a brake for preventing the movement of the elevator-car, and a lever for disengaging said brake and arranged to be impinged by said antifriction-roller, substantially as set forth.

12. In an elevator, the combination, with a weight for closing the doors and a brake for preventing the movement of the elevator-car, of a pivoted lever O for disengaging said brake, the standard *t*, through which said lever passes, the lever T′, pivoted in said standard *t* and resting upon the end of the lever O and being arranged in the line of movement of said weight, and a guide for said lever T′, substantially as set forth.

13. In an elevator, the combination, with the elevator-shaft having doors, of a weighted cable suspended in said shaft, antifriction devices arranged between said cable and door, and a pulley secured to the door and adapted to engage the cable between said antifriction devices, substantially as set forth.

14. In an elevator, the combination, with the elevator-shaft having a door, of a weighted cable suspended in said shaft, antifriction-rollers journaled one above the other between said cable and door, a bracket or lug on said door projecting between said antifriction-rollers, and a pulley on said bracket or lug adapted to engage said cable, substantially as set forth.

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