

(No Model.)

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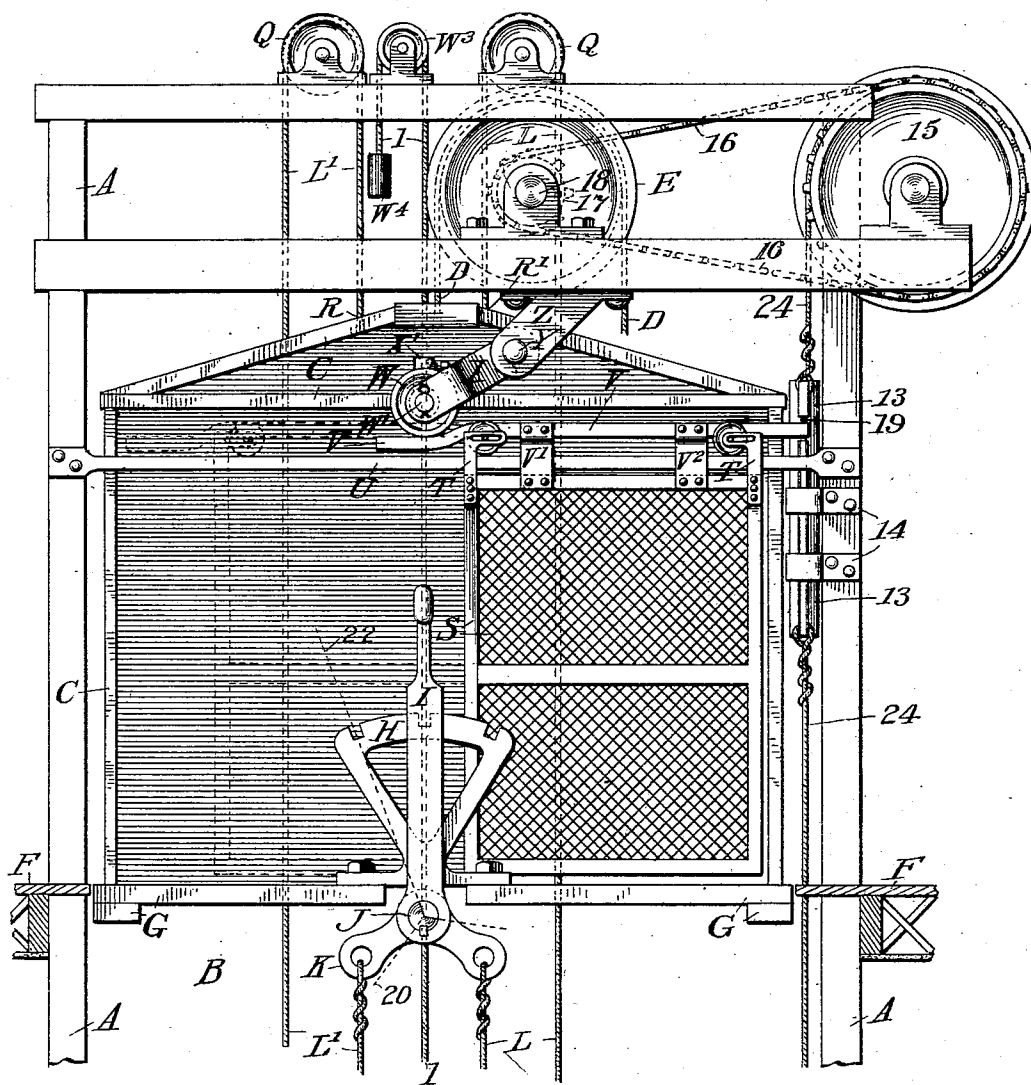
A. C. HUNT.

LOCKING MECHANISM FOR ELEVATORS.

No. 564,884.

Patented July 28, 1896.

Fig. 1.



Witnesses.

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(No Model.)

3 Sheets—Sheet 2.

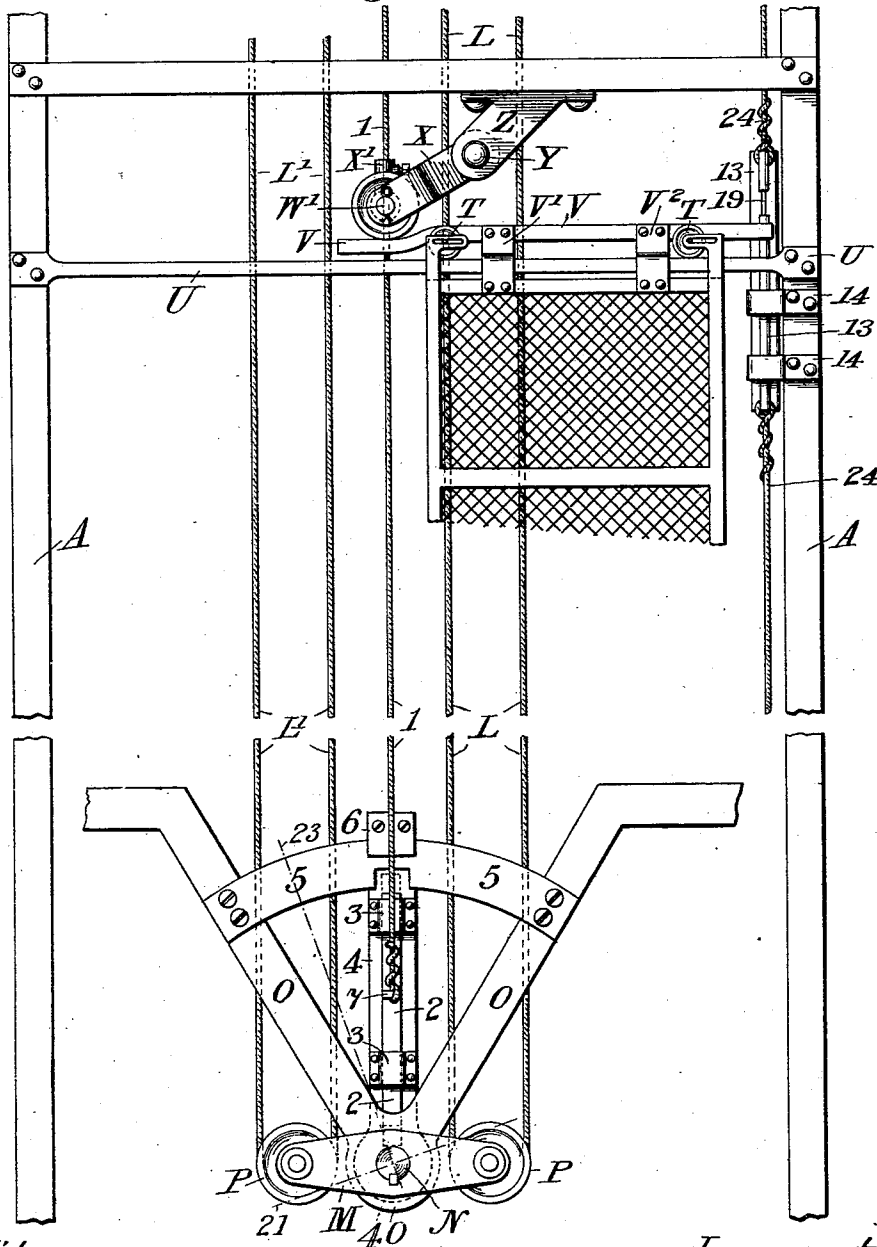
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Fig. 1^a



Witnesses.

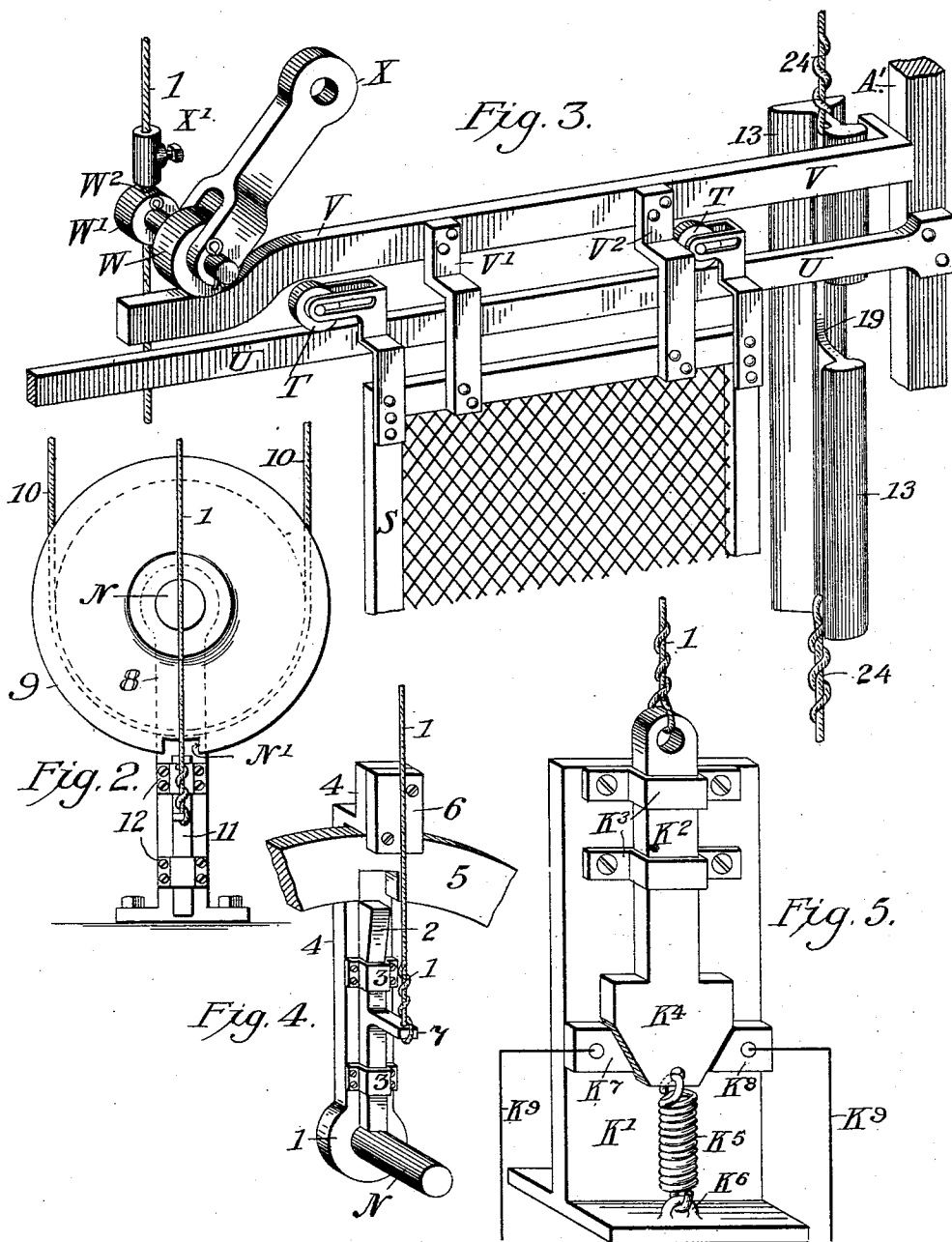
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UNITED STATES PATENT OFFICE.

ALBERT CAMERON HUNT, OF DENVER, COLORADO, ASSIGNOR TO JOEL W. STEARNS, OF SAME PLACE.

LOCKING MECHANISM FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 564,884, dated July 28, 1896.

Application filed December 26, 1895. Serial No. 573,401. (No model.)

To all whom it may concern:

Be it known that I, ALBERT CAMERON HUNT, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Locking Devices for Elevator-Controlling Mechanisms and Elevator-Doors; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in automatic elevator-door and elevator-controlling-mechanism locks; and the objects of my invention are, first, to provide an automatic lock for elevator-doors; second, to provide a lock operating independently of the operating and controlling lever; third, to provide a lock which will lock the operating mechanism against operative movement by the operator until the elevator-door is closed; fourth, to provide means for automatically locking and relieving the doors of elevators controlled by either the lever or pull-rope systems; fifth, to provide a system of locking a plurality of elevator-doors which will lock all the doors and keep them locked, except when the car is in loading and unloading position opposite a door at a landing, and will then only release the door at the landing at which the car is, and will lock the operative mechanism of the car the moment the door is started open and will hold it locked until it is closed. I attain these objects by the mechanism illustrated and described in the accompanying drawings and specifications, in which—

Figures 1 and 1^a represent a vertical elevation of my improved elevator-door lock, showing its attachment to elevators operated by the lever system. Fig. 2 represents a modification of the lower terminal of the means for controlling elevators known as the "rope system." Fig. 3 represents a fragment of the locking mechanism of an elevator-door. Fig. 4 represents a fragment of the locking mechanism of the lower terminal of the elevator-

operating mechanism. Fig. 5 represents my locking device adapted to an electric elevator.

Similar letters and figures of reference refer to similar parts throughout the several views.

Referring to Fig. 1, A designates posts at the corners of an elevator-well hole B. C designates an elevator-car suspended therein by a rope D, which passes over a pulley E and is connected with a suitable power device.

F designates a floor or elevator-landing.

G designates the floor of the car. To this floor is secured the operating mechanism of the lever system of operating passenger-elevators. It consists of the locking-segment bracket H, which is bolted to the floor, the lever I, which is secured rigidly to the shaft J, which is also supported in suitable bearings secured to the car-floor, and the rock-arm K. This rock-arm is also keyed to the shaft. To the ends of the rock-arm are secured the ends of ropes L and L', which extend to the rock-arm M, which is keyed to a shaft N. This shaft is connected with mechanism which is adapted through the medium of the lever I in the car to raise and lower and start and stop the elevator in the elevator-well.

O designates a support for the shaft N and rock-arm M.

The rope L passes around the sheave P, which is pivoted in the rock-arm M. It extends from this sheave up to the top of the elevator and around the sheave Q and descends from it to the top of the car, to which it is secured at the point R. The rope L', which is secured to the opposite end of the rock-arm K, is arranged like rope L. It passes downward from the rock-arm K to and around the sheave P', which is pivoted in the opposite end of the rock-arm M, and from it extends upward to the top of the elevator and around the sheave Q' and down to the top of the car, to which it is secured at point R'. Each rope extends in a continuous piece from each end of the rock-arm K to the top of the car. The mechanism just described constitutes substantially the lever system of controlling elevator-cars in common use.

I will now describe my improved locking mechanism and its application to it.

S designates a door at a floor or landing

leading into the elevator-well and into the elevator-car when it is opposite it, as shown in Fig. 1. To the door rollers T are secured, which adapt it to run on a track U. This track is secured to the corner-posts A and A'. Above the track U, I place a second track V, securing it to the door by straps V' and V². This track extends beyond the door at both ends. At the rear edge of the door it is curved downward a few inches to form a curved or inclined step. It then continues for a short distance approximately parallel with its main portion and with the door. The opposite end has a portion of the end bent at right angles to its length inwardly toward the center of the elevator-well, for a purpose which will be hereinafter described. A roller W rests normally on the extreme opposite end of the track and is adapted to run up the step and on the track when the door is pushed open. The roller or sheave W is pivoted by a pin W' in an arm X, one end of which is bifurcated to receive it. The opposite end is pivoted by a bolt Y to a support Z, which is secured to the posts A and A' of the elevator-way or to its front inclosure, which is not shown. One end of the pin W' is enlarged and a hole W² is made through it. (See Fig. 3.) Through this hole the rope or wire 1 passes and continues over a sheave W³, which is pivoted to the elevator inclosure. A small weight W⁴ is attached to its end to keep it taut. This wire or rope extends to a sliding bolt 2, to which it is also secured. The rope, however, passes through the pivoting-pin W' of an arm similar to arm X, which is secured in operative relation to each door on every landing or floor of the elevator-well, as every door opening into the elevator-well and into the car is arranged the same. A fragment of the door S on the floor below the one the car is represented to be at is shown in Fig. 1. On the wire or rope 1 I secure clips or stops X'. These consist of pieces of metal provided with a central hole through which the rope passes, and a set-screw for securing them to it. The clips are secured to the wire in positions to rest on the tops of the pins W' of each arm. Consequently if any one arm is raised by its door being rolled back it will carry the clip and the rope up with it, but the rope will slide through the pins of the other arms and the weight W⁴ will keep it taut above the arm raised. The sliding bolt 2 is secured freely by clips 3 to an arm 4, which is keyed to the shaft N. A segment 5 is secured to the support O, concentric with said shaft. The arm extends to the segment and is arranged to slide along one side of it and lap over its top edge flush with the side opposite the one it slides on. A plate 6 is secured to its top to project down the side of the segment, thus securing the arm to it against displacement, but allowing it freedom to oscillate on it as the shaft is oscillated by the controlling-lever in the car. I cut a recess in the segment, arranging it in vertical aline-

ment with the axis of the shafts J and N and the controlling-lever in the car. The recess is adapted to receive the upper end of the bolt 2, the latter to fit very freely in it. A projection 7 is provided on the bolt 2 to secure the lower end of the rope.

In Fig. 2 I illustrate the lower terminal of the pull-rope system. The shaft N is loosely secured to a bar 8, the opposite end of which is secured to a suitable foundation. The bar 8 is placed close to one side of the sheave 9, around which the operating rope 10 passes. The sheave is secured to the shaft N. On the bar 8 a sliding bolt 11 is secured by clips 12, in which it is free to move vertically. A recess N' is cut in the periphery of the sheave which is adapted to receive the upper end of said bolt. This recess is made considerably larger than the bolt, as the movement of the rope by the operator in the car is not defined by fixed stops, as in the case of the lever system. The lower end of the rope 1 is secured to the bolt 11 in a manner similar to that shown in Figs. 1 and 4. The arrangement of the elevator-doors for this system, as well as for electric systems, is exactly the same as for the lever system.

To adapt my locking device to electrically controlled and operated elevators it is only necessary to arrange the device at the bottom end of the rope 1 to break the electric circuit which operates and controls the elevator-car. There are several ways of doing this, but I preferably carry out this feature of my invention in the following manner: Referring to Fig. 5, K' designates a support on which the sliding bolt or plug K² is secured to move freely, vertically, by the clips K³. This sliding bolt or plug is made of conductive metal. At its lower end K⁴ it is enlarged and then beveled and converged to a point. Through the point one end of a rebounding spring K⁵ is secured, the opposite end of which is secured to a boss K⁶ on the support K'. K⁷ and K⁸ are oppositely-disposed contact-terminals connected in an electric circuit of which the wire K⁹ is a fragment. This circuit is the operative circuit of the elevator. The terminals K⁷ and K⁸ are provided with edges beveled to receive and fit against the beveled edges of the plug K², as shown in Fig. 5, in which position the circuit is closed. To the top of the plug the rope 1 is secured. When the rope is lifted by the opening of a door by the operator, and its pivoted arm is raised, together with the rope, this plug is also lifted up away from the terminals, which breaks the circuit. When the door is closed by the operator, the spring, which is expanded by raising the plug, rebounds and draws the plug down against the edges of the terminals and again closes the circuit. As this current-breaker is inserted in the elevator operating and controlling circuit, the car cannot be moved by the operator until the circuit is closed, when he has once started to open a door, and until he closes the door the con-

trolling mechanism is inoperative, but is rendered operative the moment the plug drops into the terminals by the closing of the doors.

The end of the track V, which is turned sidewise, rests on and its bent end extends over a bar 13, preferably made of T-iron. This bar I term a "locking-bar." It is supported by suitable bearings 14, which are secured to the post A', or to parts of the inclosure of the elevator-well. This locking-bar travels up and down freely in its supports in the elevator-well, being arranged to always move in the same direction as the elevator-car, but it is arranged to move but a fraction of the distance traveled by the car. Consequently it need be but about a foot or two in length.

At each landing, opposite the ends of the track, a locking-bar is placed in operative relation to receive the hooks of the track. The bars are connected together by a rope 24, which extends from the upper one to a sheave 15, around which it is wrapped and the end fastened to it. This sheave is also provided with a sprocket-teeth portion, which is placed to one side of the rope-tread of the sheave, and a sprocket-chain 16 runs from it to a small sprocket-pinion 17, secured to the shaft 18, which supports the car-sustaining cable D. The proportion of the diameter of the sprocket-pinion to that of the sprocket-sheave is such that the travel of the car in the elevator-well and the revolutions of the sprocket pinion and sheave 15 to make this travel are reduced to a rotative movement of one or more, or of only a partial revolution of the sheave-wheel 15. This slight movement of the sheave-wheel operates to move the locking-bars but a fraction of the distance the elevator-car travels in the elevator-well. In each one of the locking-bars a recess 19 is cut through the tread and web portion wide and deep enough to allow the bent end of the track to pass very freely through. These recesses are arranged in the locking-bars intermediate of their ends at predetermined varying distances, successively arranged from floor to floor of the elevator-well, relatively to the travel of the elevator. Thus at the top floor the recess 19 registers with the track V and the door can be opened, but at the door below the slot is above the track, and the end of the track hooks over the locking-bar and locks the door at the landing closed, as well as all doors below it.

The operation is as follows: When the operator shifts the controlling-lever I to lower the car, one end of the rope L is raised and the same end of the rope L' on the opposite end of the rock-arm K is lowered. The rock-arms K and M and shafts J and N are also partially rotated, which moves the arm 4 on the segment 5 at the lower terminal, the two rock-arms, the controlling-lever, and the arms assuming the positions of the dotted lines 20, 21, 22, and 23; but when the car is stopped at a landing the controlling-lever is brought

to the center and fastened in a vertical position to its locking-segment, and the various parts aline themselves as represented in Fig. 1. The operator then rolls back the door, which is unlocked free from the locking-bar, as the recess of the locking-bar at that landing is in position to register with the end of the track U and it can pass through it as the door is rolled back. The minute the door starts back the track V raises the roller up the step onto the main portion. When the roller is lifted by the track, the rope 1 is also lifted, and also the bolt 2, which slides upward in the clips into the slot in the segment and prevents the shaft N and the rock-arm 4 from being moved by the controlling-lever in the car, as the operator cannot move it far enough to start the operating mechanism until the door is closed, which allows the roller and its supporting-arm and the rope to drop, and consequently the bolt 2, which is heavy enough to drop and rest on the shaft when the rope is slacked.

When a rope-lifting arm is raised by a door that is being opened, the other rollers and their supporting-arms are not raised, and the wire moves through the holes in their pivoting-pins, and the doors both below and above are not released, as the slots in their respective locking-bars do not come opposite the hooked end of the track V. The rope-lifting rollers and arms above any landing at which the car is stopped are not affected, as the rope 1 is simply slacked and they cannot be opened, as the slots in their locking-bars do not register with the hooked end of the track. Consequently only the door of a landing at which a car is stopped can be opened, and the controlling-lever and operating mechanism are also locked when a car is stopped at a landing from the time the operator commences to roll the door open until he closes it.

This locking mechanism is very simple, durable, and effective, and that portion of it which locks the controlling mechanism can be applied to elevators in use which are already equipped with some form of door latching and locking mechanism. The door-locking mechanism can also be applied to elevators already provided with a different lock for the controlling mechanism. For elevators not equipped with some form of locking mechanism, they must be applied and used conjunctively; and while I have illustrated the preferred construction and arrangement of my locking mechanism, I do not wish to be limited strictly to it, as several modifications of its parts might be made without departing from the principle of my invention.

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

1. The combination with the elevator-car and controlling mechanism of an arm secured to the lower terminal shaft of the controlling mechanism, a fixed segment in engagement with said arm, a sliding bolt on said arm, said

segment having a notch adapted to receive said sliding bolt, a track secured to each door and movable therewith, having a downward stepped portion at its rearward end, a roller normally in engagement with the step portion of said track and in the path of its main portion, an arm supporting said roller and pivoted to the elevator inclosure, and a rope connecting said roller and said sliding bolt whereby when the door is opened, the controlling mechanism is locked against manipulation by the operator, substantially as described.

2. The combination in an elevator-locking mechanism, of the doors each having a track secured thereto, a pivotal arm carrying a roller and arranged in the path of said door-track, and adapted to be raised thereby, the rope secured to said arms and adapted to be raised by any one arm while the others remain in their normal state of rest, as its respective door is opened and closed, the arm secured to the lower terminal of the controlling mechanism, the fixed segment and the sliding bolt adapted to be raised by said rope and lock the said lower terminal of said controlling mechanism to said segment, substantially as set forth.

3. The combination in an elevator-locking mechanism, of the doors, the tracks secured thereto, the pivoted arms, the rollers thereon, the pivoting-pins, the rope and the adjustable clips.

4. The combination in an elevator-locking mechanism, of the doors, the rope suspended in the elevator-way, the adjustable rope-raising clips secured thereto, arms pivoted to the elevator inclosure at each landing in operative relation to said clips, means secured to said door for raising said arms when the doors are opened, and means substantially as described connected to the lower end of said rope for locking the lower terminal of the controlling mechanism.

5. In an elevator-locking mechanism the combination with the car's controlling mechanism and the elevator-inclosure doors, of a rope suspended in the elevator-well, an arm pivoted at each floor in the opening path of the doors, rollers pivoted to said arms, there being an opening through said roller-pivot through which said rope passes, adjustable stops on said rope arranged and adapted to be engaged by said arms to lift said ropes, a track secured to each door, a stepped portion on which said rollers normally rest, a higher portion upon which said rollers are adapted to be raised and retained while its respective door is open, an arm secured to the shaft of the lower terminal of the controlling mechanism, a fixed segment to which said arm is slidably secured to oscillate, a notch in said segment in vertical alinement with the said shaft, and with the stop-locking axis of the controlling-lever in said car, a sliding bolt on said arm in operative relation to the slot in said segment, substantially as herein set forth.

6. The combination with the elevator-well, the doors therein, the car and the controlling mechanism, of a track having a hooked end secured to each door in the elevator-well and movable therewith, the sliding bolt and operating-rope, the rope-raising arms arranged in operative engagement with said door-tracks, the bar and segment, a pinion sprocket-wheel secured to the shaft that supports the elevator-car, its carrying rope and sheave, a large combined sprocket-wheel and sheave having a predetermined ratio of diameter to said pinion journaled with its sheave-receiving tread approximately parallel with the side of the well adjacent to the front edge of the elevator-doors, a rope or wire encircling the sheave portion of said combined sheave and sprocket-wheel, and extending to the lower landing of the elevator-well, a locking-bar interposed in the said rope or wire at each floor or landing and positioned to engage the said hooked end of each of said tracks, a notch through each of said locking-bars adapted to release said hooked ends of said tracks and arranged in each locking-bar of each landing at predetermined points in relation to its respective track and the travel of the elevator-car, and a sprocket-chain connection between said sprocket-pinion and the sprocket-wheel of said combined sprocket-wheel and sheave, whereby the locking-bars are raised and lowered in unison with said car, but at a predetermined fraction of the distance of the car's travel, as set forth.

7. The combination in an elevator-locking mechanism, of the doors, the track secured to each door and movable therewith, the pivotal arms, the rollers therein arranged to be operatively engaged by said tracks, the pivoting-pins of said rollers adapted to freely support the operative rope of the locking-bolt, the locking-bolt-operating rope, the car-controlling ropes, the lower terminal locking device at the lower end of said ropes, and means secured to said car-operative rope of the locking-bolt and adapted to cooperate with said arms whereby any one arm may lift said rope while the other arms remain in a state of rest, as specified.

8. The combination in an elevator-locking mechanism, of the inclosure-doors having each a track movable therewith, means substantially as described for locking the controlling mechanism by the reciprocative movement of said doors, and for locking said mechanism by said movement of any one door independent of the others, a hooked end on each track at the entrance end of said doors, a vertically-sliding locking-bar arranged in operative relation to each door and in operative engagement with the hooked end of each door's track and adapted to lock each door closed independent of the others, suitable supports for said locking-bars, a slot in each locking-bar adapted to move in a position to register with said hooked end of said door-tracks and arranged in each locking-bar at predeter-

5 mined points of its vertical movement, relative to the position of the car in respect to each, whereby each door in its turn is released from its locking-bar when the car is at its respective landing, and a differential power connection between the elevator and said locking-bars whereby they are moved conjunctively and in unison with said car, and the said locking-bars are moved at a predeter-

mined fraction of the distance traveled by the elevator-car, substantially as described. 10

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

ALBERT CAMERON HUNT.

Witnesses:

ADAM G. MCCHESNEY,
JOEL W. STEARNS.