No. 739,078. PATENTED SEPT. 15, 1903.

G. HAIL.

ELEVATOR SAFETY DEVICE.

APPLICATION FILED NOV. 13, 1902.

NO MODEL. 2 SHEETS—SHEET 1

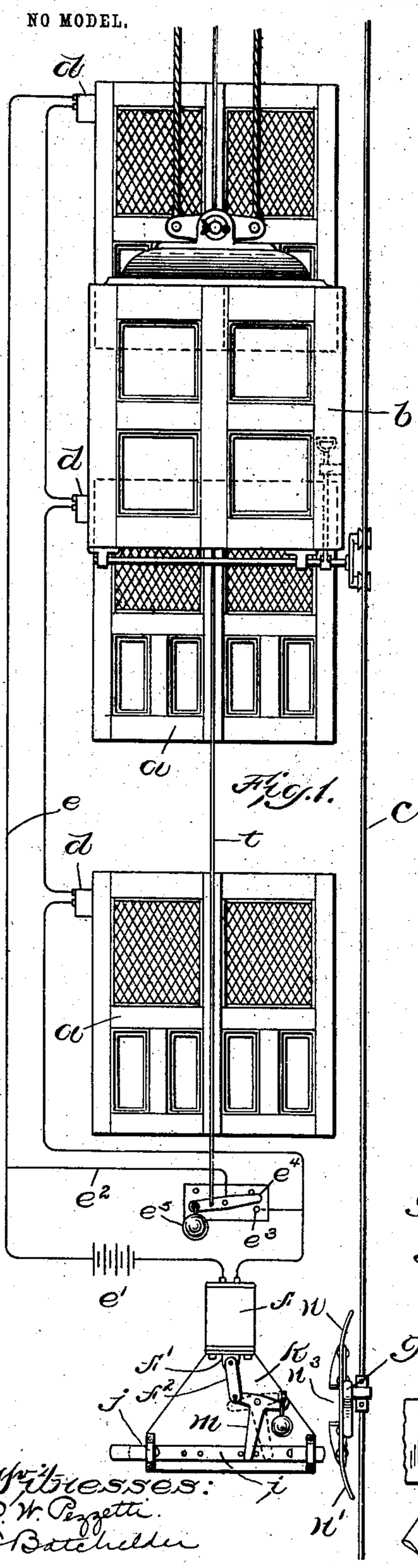

Fig. 1.

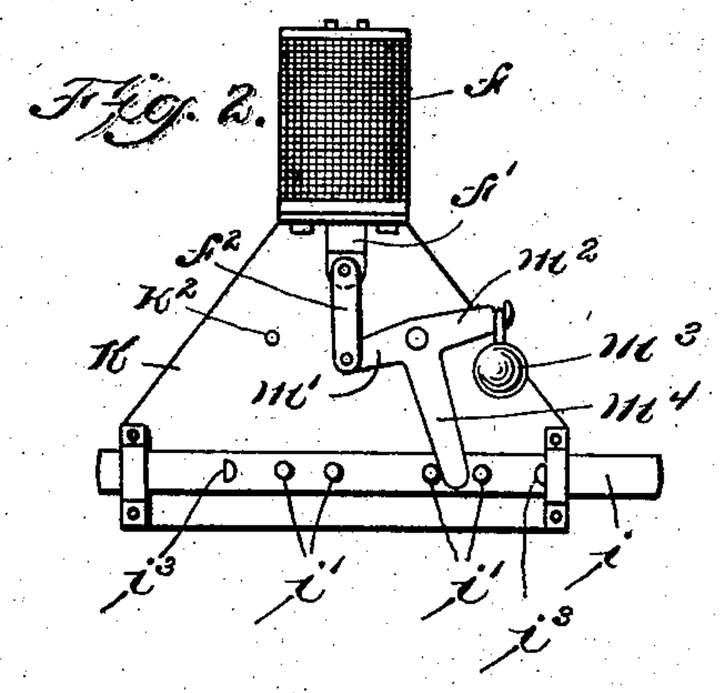

Fig. 2.

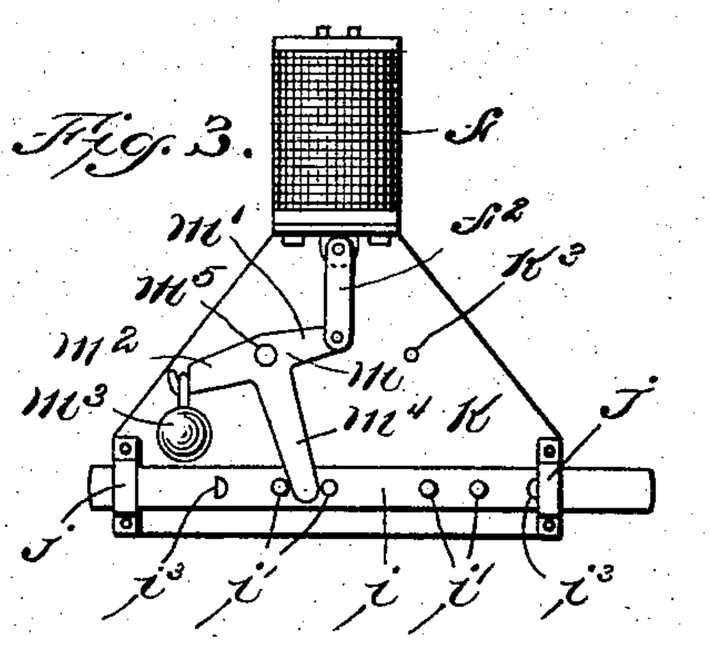

Fig. 3.

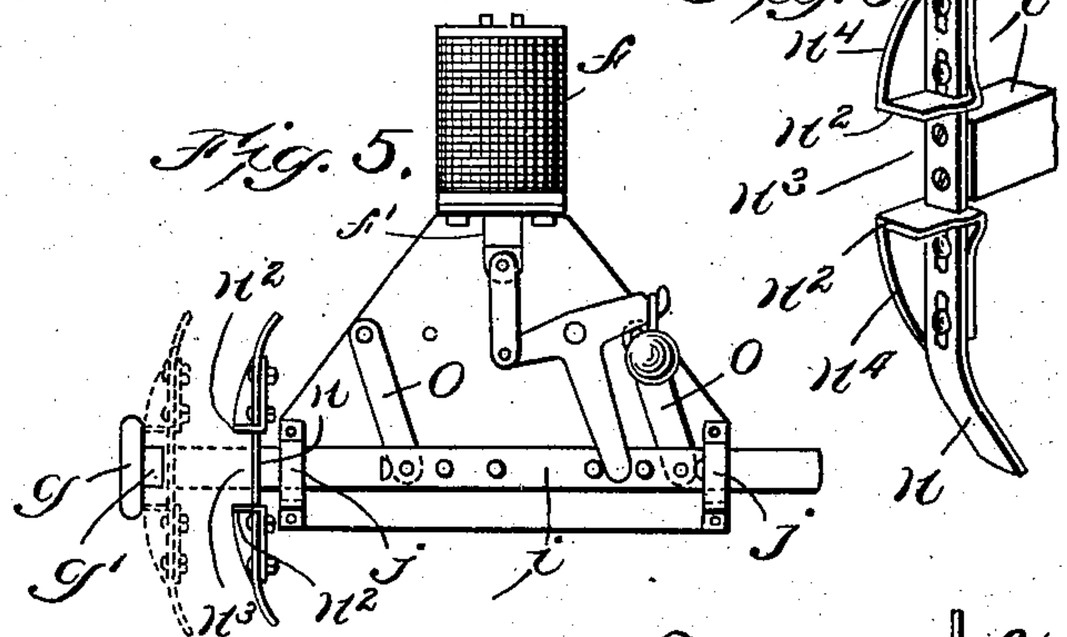

Fig. 5.

Fig. 6

Fig. 4.

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ELEVATOR SAFETY DEVICE.

APPLICATION FILED NOV. 13, 1902.

NO MODEL. 2 SHEETS—SHEET 2.

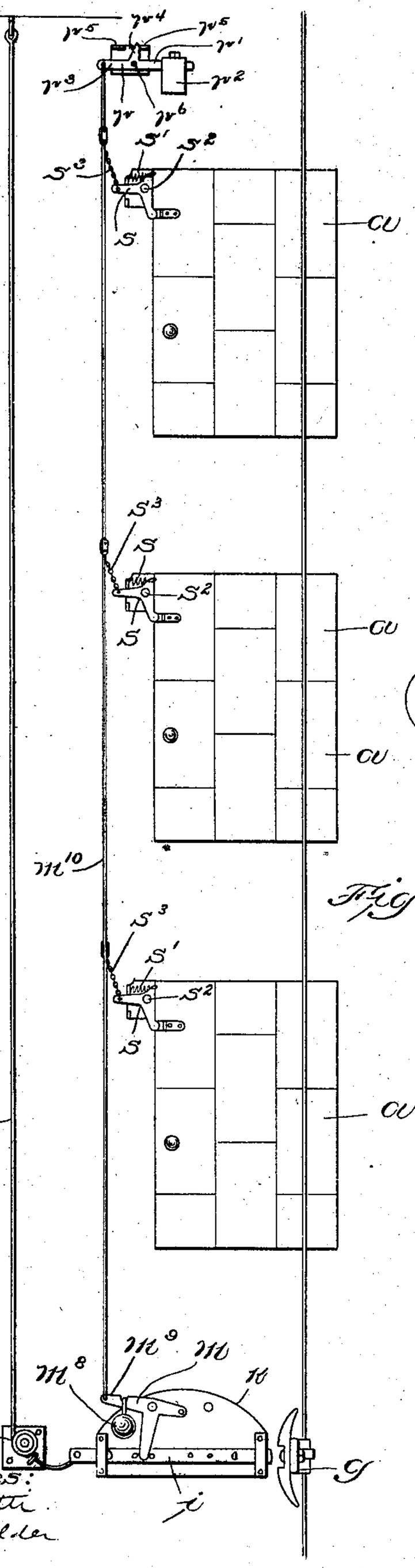

Fig. 8.

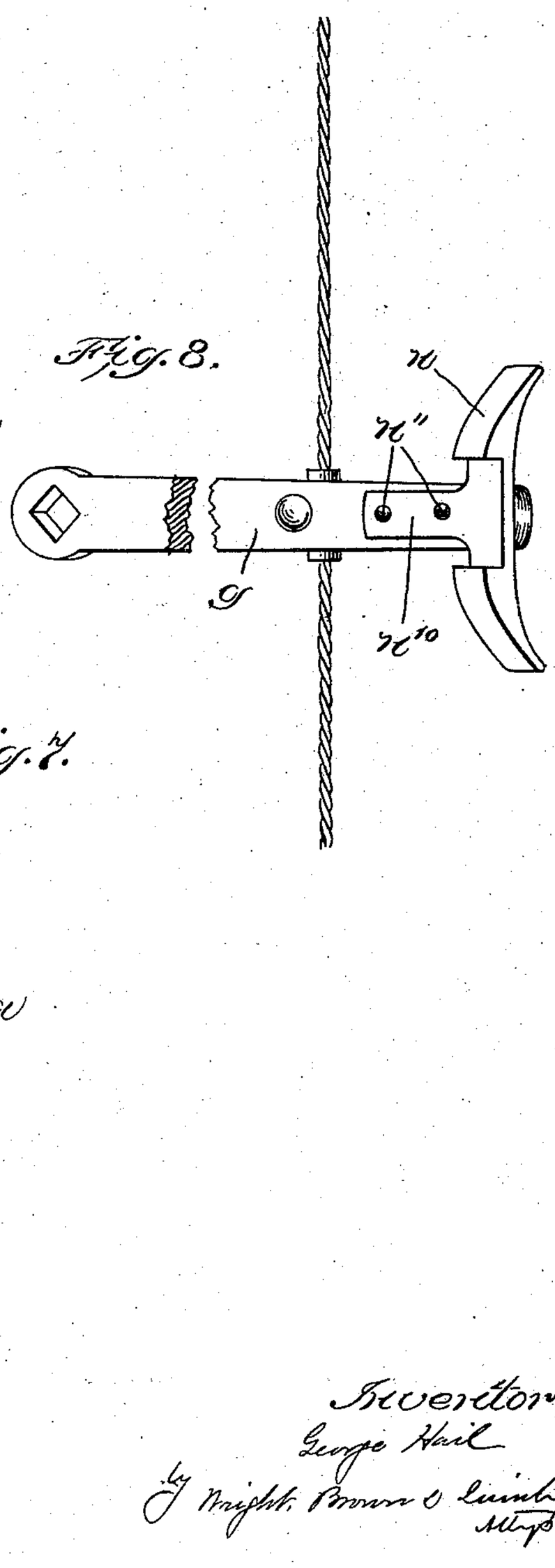

Fig. 7.

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No. 739,078. Patented September 15, 1903.

UNITED STATES PATENT OFFICE.

GEORGE HAIL, OF PROVIDENCE, RHODE ISLAND.

ELEVATOR SAFETY DEVICE.

SPECIFICATION forming part of Letters Patent No. 739,078, dated September 15, 1903.

Application filed November 13, 1902. Serial No. 131,096. (No model.)

To all whom it may concern:

Be it known that I, GEORGE HAIL, of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Elevator Safety Devices, of which the following is a specification.

This invention has relation to door-controlled elevator safety appliances, having for its object to provide an improved locking device to be used in connection with the valve-lever, so that when the door is opened the valve and its lever cannot be operated and which at the same time will not lock the valve-lever in open position in case a door is opened when the elevator-car is in motion.

The invention has further for its object to provide means for withdrawing the lock from engagement with the lever in case the locking mechanism should be actuated by the opening of a door when the car is at rest at a point remote therefrom. It is possible with many of the existing forms of door-locked controllers to have the car locked against movement either at a landing or at a point between two landings by the opening of a door either above or below the car.

According to this invention mechanism is provided for temporarily rendering the locking mechanism inoperative to permit the car to proceed to the landing where the door is opened, so that the operator may close the said open door. This freeing mechanism is of great benefit to elevator-repairers and janitors by enabling them to move the car from the car itself or from the landing, as they desire, while working upon or around the car regardless as to whether the doors are open or closed.

Referring to the drawings, Figure 1 represents more or less conventionally an elevator shaft or hatchway, an elevator-car, the valve-lever, and the mechanism by which the lever is locked when one of the landing-doors is open. Fig. 2 represents one form of lock which may be employed to engage the valve-lever. Fig. 3 represents the same contrivance with the bell-crank lever shifted, so as to render the device applicable for normally open safety-circuits. Fig. 4 represents one form of valve controlling the supply of fluid to the hoisting mechanism. Fig. 5 represents another form of the locking device in which the bolt is provided with a locking member or bow. Fig. 6 represents in perspective view a form of locking-bow which may be secured to the valve-lever. Fig. 7 represents more or less diagrammatically another embodiment of the invention. Fig. 8 represents in perspective view the valve-lever, the controller-line attached thereto, and one form of bow secured to said lever.

On the drawings, referring more particularly to Fig. 1, *a a* indicate the landing-doors, which are normally closed, and *b* the elevator-car.

c indicates the controller or rope, which may be actuated by the attendant on the car. This rope or line may be either grasped by the hand of the operator or else it may be shifted by means of a wheel or lever, the drawings illustrating a lever for accomplishing this purpose.

Adjacent each door is an electric switch *d*, arranged in a safety-circuit *e*, said circuit including a source of supply, as a generator, (indicated at *e'*,) and an electromagnet *f*. The line *c* is connected by any suitable means with the lever *g* of the ordinary valve mechanism, (indicated as a whole at *h*.) By raising or lowering the line the valve-lever *g* may be shifted to cause the admission of fluid into the hoisting mechanism or to cut off the supply therefrom in the well-known way. The locking mechanism includes a member *i*, which for convenience of nomenclature may be termed a "bolt," although by that term there is no intention of limiting the member to any particular form or shape. This bolt is reversible end to end and is mounted in guides *j j* on a supporting-plate *k*, said supporting-plate likewise supporting the magnet *f*. The said magnet *f* is of the solenoid type, and its plunger *f'* is connected by a link f^2 with a lateral arm *m'* of the T-shaped lever *m*. The other lateral arm m^2 of the said lever is provided with a weight m^3, which serves to partially balance the weight of the plunger *f'*, the plunger being of sufficient weight, however, to swing said lever about its center of motion when it is permitted to drop. The lever *m* is provided with a depending arm m^4, which extends loosely between a pair of pins

i' i', projecting from the bolt i. The lever m is fulcrumed upon a stud m^5, projecting from the plate k, said parts being constructed and arranged whereby when the plunger f' is moved upward the three-armed lever m is moved to the full-line position in Fig. 1, so as to retract the bolt or lock i. When the plunger drops, however, the lever drops to the dotted-line position, so as to project the bolt, as shown in Fig. 2. For convenience the operative means between the doors and the lever m is illustrated as comprising a normally closed safety-circuit with switches whereby when one of the doors is open the solenoid is deënergized to permit the plunger to drop and effect the projection of the bolt i; but it will be understood that any equivalent means may be employed in lieu thereof, the invention not relating to the particular operative means between the door and the lock, but to the locking mechanism coacting therewith.

The bolt i is arranged substantially at right angles to the plane of movement of the lever g, and one of the parts (either bolt or lever) is provided with a locking member or bow, with which the other is adapted to be engaged. In Fig. 1 the locking member or bow is illustrated as being secured to the lever g, whereas in Fig. 5 the said member is shown as mounted upon the bolt i. This member consists of an elongated strip n, bent at its ends, as at n', and having opposing shoulders n^2 n^2 to form a notch or space n^3 between them. These shoulders may be formed directly on the strip n, as shown in Fig. 8, or else they may be formed separately and secured thereto, as shown in Fig. 6, in which case they are adjustable longitudinally of the bow to compensate for variations in the play of the lever due to one cause or another. The projection which forms each shoulder is provided with a convex edge n^4, which forms to all intents and purposes a continuation of the curved surface of the bent end n'.

Where the locking member or bow is attached to the valve-lever g, as shown in Fig. 1, the notch or space n^3 between the shoulders n^2 is of sufficient width to receive the end of the bolt i and at the same time to permit the slight relative movement of the lever g for allowing a certain requisite loose or idle movement of the valve when it is in neutral position. Where the bow is mounted upon the end of the bolt i, the lever g is provided with a relatively small projection g' to enter the notch or space n^3. From this description it will be seen that with either arrangement the projection of the bolt i by the accidental or malicious opening of the door when the car is running will not prevent the free movement of the lever g, for the curved ends of the bow (whether carried by the bow and engaged by the lever, or vice versa) when the lever g is swung upon its fulcrum will force the bolt i gradually backward until the projection g' or the end of the bolt i registers with the recess, socket, or notch n^3 of the bow, whereupon the bolt will snap forward and the valve-lever will be held against further actuation until the open door is closed and the bolt withdrawn.

As has been stated, the operative means between the doors and the bolt in Fig. 1 includes a normally closed electric circuit; but should it be desired to employ the bolt in connection with a normally open circuit it may be done by shifting the fulcrum or stud m^5 of the three-armed lever m to an aperture k^2 in the plate k, as shown in Fig. 3, said plate being provided with the apertures k^2 k^3 for the fulcrum or stud m^5. For the same purpose the bolt i is provided with two pairs of pins i' to receive the end of the arm m^4, according to the location of the lever. To limit the movement of the bolt, it is provided with suitable stops, as at i^3, to engage the guides j. In lieu of supporting the bolt i in the guides j it may be supported upon the swinging links o o, as shown in Fig. 5, in which event the guides j merely serve to prevent the dislocation of the bolt. Ordinarily while the car is running the doors are all closed and the locking-bolt is retracted and out of the path of movement of the valve-lever. When a door is open, however, the locking-bolt is operated by the operative means between the doors and said bolt, and the latter is thrown forward to locking position, as shown in dotted lines in Fig. 5. Should a door be opened while the car is running, it will not prevent the free movement of the valve-lever to neutral position, inasmuch as the bolt will be forced backwardly by the bow, as previously stated, until the bolt and the lever are engaged by the shoulders n^2. It may be stated that if the lever g is to the left of the bolt i in Fig. 1 a normally open circuit could be used or the lever m could be shifted to the position shown in Fig. 3, so as to retain the normally closed safety-circuit.

In Fig. 7 an embodiment is illustrated in which the operative means between the doors and the bolts is of a mechanical nature. In this instance the bolt i is adapted to be actuated by the lever m, one arm of which is equipped with the weight m^8. This last-mentioned arm is indicated at m^9, and it is connected by a rod or wire m^{10} with a three-armed lever r. The last-mentioned lever is provided with an arm r', carrying an adjustable weight r^2, an arm r^3, to which the rod or wire m^{10} is connected, and a third arm r^4, which plays between stops r^5, formed on a plate carrying the fulcrum r^6 for the said lever r.

In lieu of the door-actuated switches (illustrated in Fig. 1) bell-cranks s are mounted to be engaged by each door when the latter is in closed position. Upon the door being opened a spring s' swings the lever about its fulcrum s^2, and the lever is so connected by a chain or other flexible connection s^3 with

the rod or wire m^{10} that it draws the said wire downward and permits the weight m^8 on the lever m to move the bolt i into locking position. This particular form of operative means between the doors and the lever m is illustrated in Letters Patent No. 657,597, granted to E. L. Hail and George Hail September 11, 1900, and is not herein claimed as new. The bow, which is carried by the lever g, as shown in Fig. 8, is formed in one casting, having a shank n^{10}, which is secured by bolts or rivets n^{11} to the lever. In addition to the features thus far described there is provided mechanism for temporarily effecting the withdrawal of the bolt to inoperative position, even though one of the doors be open.

In Fig. 1 a shunt-circuit e^2 is provided and is arranged in multiple with that portion of the safety-circuit which includes the switches d. The said shunt-circuit e^2 includes a stationary contact e^3 and a movable contact or switch lever e^4, which is provided with a weight e^5, by which it is held open, as shown. A line t extends from the top to the bottom of the well and passes through the car or outside close to the door-opening, so as to be in position to be grasped by the attendant. The upper end of the line may be attached to a suitable support at the top of the shaft or well, and its lower end is connected to the switch-lever e^4, so that by drawing upward on the line the lever e^4 may be caused to engage a stationary contact e^3, so as to close the circuit through the solenoid f, even though a door be open and the circuit e broken at one of the switches d. By this means the operator may temporarily withdraw the bolt i, so as to permit him to shift the controller c and raise or lower the car to the door which is opened. The same result may be accomplished by mechanical means, as illustrated in Fig. 7. In this case the line t, which extends from the top to the bottom of the elevator-well, passes around a pulley t^8 at the bottom of the well and is connected with the end of the bolt i. If the bolt should be in engagement with the lever and a door be opened above or below the car, the attendant may draw upward on the line t, so as to retract the bolt i and permit him to swing the valve-lever by means of the controller.

I do not herein claim the mechanical lock-freeing mechanism *per se*, as it forms the subject-matter of a divisional application, Serial No. 162,985, filed June 25, 1903.

Having thus explained the nature of the invention and described a way of constructing and using the same, although without attempting to set forth all of the forms in which it may be made or all of the modes of its use, I declare that what I claim is—

1. A safety appliance for elevators, comprising a door, a motor-controlling mechanism, a lever pivoted to said motor-controlling mechanism, a locking member attached to said pivoted lever and extending substantially perpendicularly to the median line of said pivoted lever, said locking member having on its exposed face stops with inclined outer surfaces, a second locking member movable substantially at right angles to the plane of movement of said pivoted lever, and operative means between said door and said second locking member whereby when said door is opened the last-mentioned locking member is actuated to engage said first-mentioned member.

2. A safety appliance for elevators comprising the combination with a door, and a motor-controlling mechanism, of the following instrumentalities—to wit, a lever pivoted to said motor-controlling mechanism, a bolt movable at right angles to the plane of movement of said lever, and a locking member on one of said instrumentalities and having a recess to receive the other instrumentality, said locking member extending in lines transverse to the median line of the bolt and having stops with inclined outer surfaces, said stops being separated to form said recess substantially as described.

3. A safety appliance for elevators comprising a motor-controller, a car movable relatively thereto, a locking instrumentality adapted to move into engagement with said motor-controller, an electromagnet, an armature therefor, a counterbalancing means connected with and acting in the same direction as the armature for counterbalancing the said armature and reducing the power required to operate said locking instrumentality, door-controlled switches, and an electric circuit including said switches and said electromagnet.

4. A safety appliance for elevators comprising a door, a motor-controlling mechanism, a lever pivoted to said motor-controlling mechanism and located at the bottom of the well, a locking instrumentality movable toward and from the plane of movement of said lever, and a bow mounted upon said lever and extending in the direction of its lines of movement beyond its sides, said bow having on its exposed face stops with inclined outer surfaces, said stops being separated to form a recess for the reception of said locking instrumentality.

5. A safety appliance for elevators comprising a car, a controller, a lock therefor, one or more doors, a safety-circuit including one or more door-actuated switches and an electromagnet for the lock, a supplemental switch relatively to which the car travels, electrically connected with the electromagnet, and means independent of said door or doors for actuating said switch to control the electromagnet.

6. A safety appliance for elevators comprising a car, a controller, a lock therefor, a door, a safety-circuit including a door-actuated switch and an electromagnet for the lock, a supplemental switch located in the well, and

means operable from the car for moving the said supplemental switch.

7. A safety appliance for elevators comprising a car, a controller, a lock therefor, a door, a safety-circuit including a door-actuated switch and an electromagnet for the lock, a supplemental switch located in the well, and means in the well independent of said safety-circuit and operable from the car for moving said supplemental switch.

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

GEORGE HAIL.

Witnesses:
HENRY A. GREENE,
AUGUSTA ALLEN.