

S. M. MILLER.
SAFETY APPLIANCE FOR ELEVATORS.
APPLICATION FILED JULY 15, 1907.

1,017,684.

Patented Feb. 20, 1912.

2 SHEETS—SHEET 1.

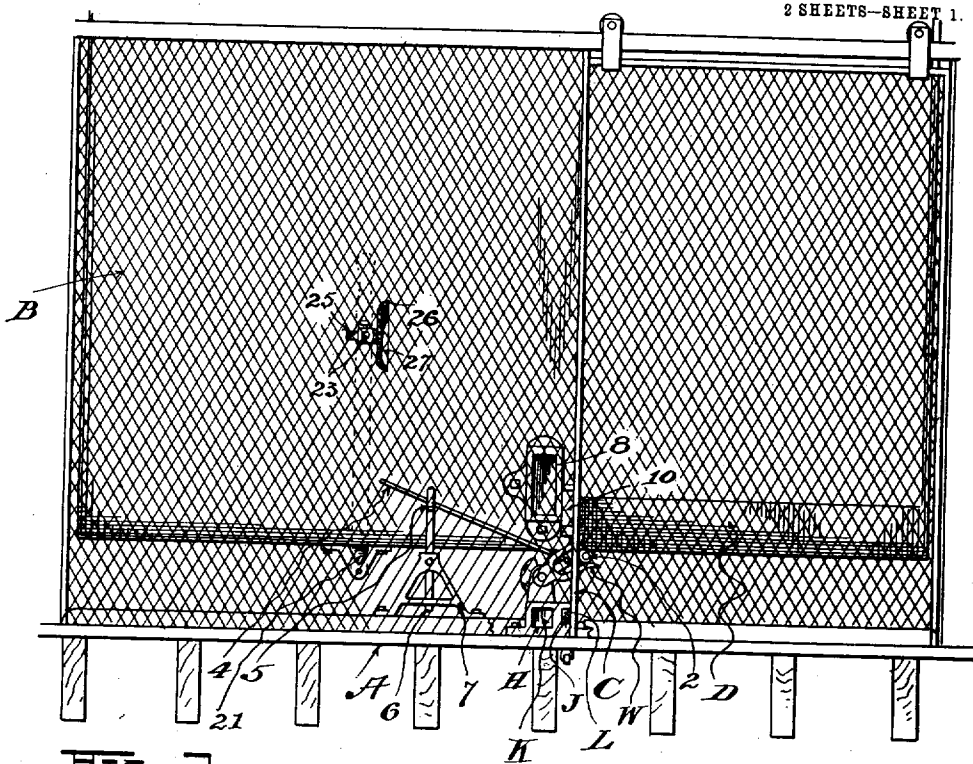


FIG. 1.

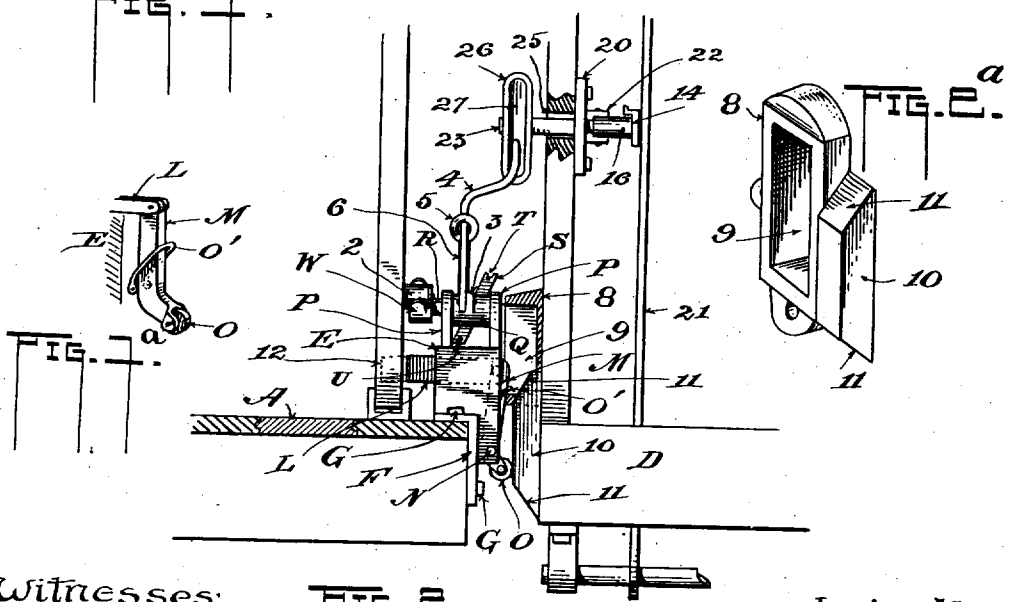


FIG. 2.

FIG. 3.

Witnesses:
Loretto White
Robert Irving

FIG. 2.

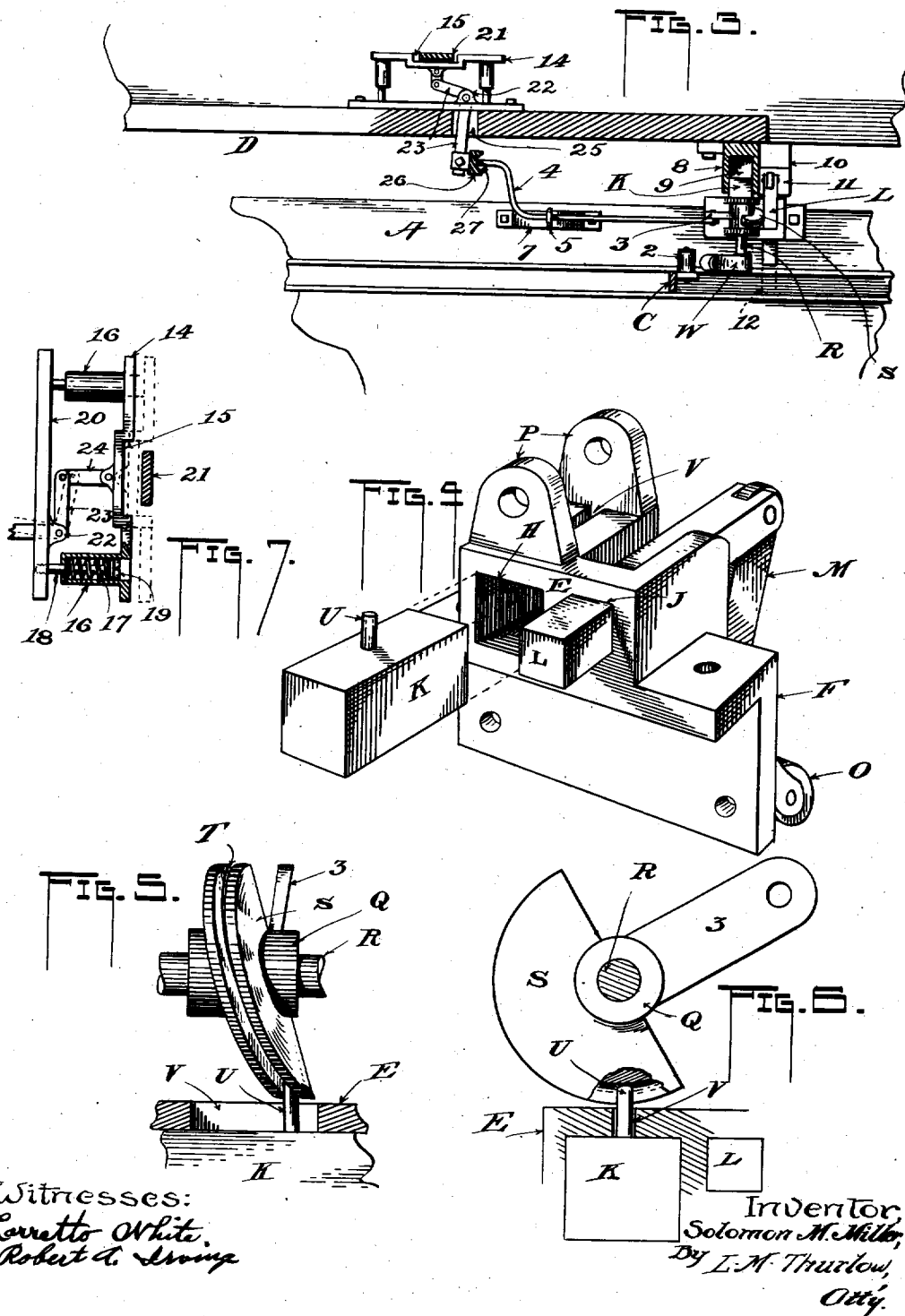
Inventor:
Solomon M. Miller,
By I. M. Thurlow,
Att'y.

S. M. MILLER.
SAFETY APPLIANCE FOR ELEVATORS.
APPLICATION FILED JULY 15, 1907.

1,017,684.

Patented Feb. 20, 1912.

2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

SOLOMON M. MILLER, OF PEORIA, ILLINOIS.

SAFETY APPLIANCE FOR ELEVATORS.

1,017,684.

Specification of Letters Patent.

Patented Feb. 20, 1912.

Application filed July 15, 1907. Serial No. 383,951.

To all whom it may concern:

Be it known that I, SOLOMON M. MILLER, citizen of the United States, residing at Peoria, in the county of Peoria and State of Illinois, have invented certain new and useful Improvements in Safety Appliances for Elevators, and do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention has reference to a safety appliance for elevators.

The object of the invention is to provide a locking arrangement for the elevator-door, the controlling lever of the car, and the car itself, such arrangement being applicable to passenger and freight elevators alike, the purpose of which is to provide against accidents to the persons carried by said elevator or car.

Another object is to provide means to prevent the starting means of the elevator-car from being moved when said car is at the floor or landing while the elevator door is standing open or even ajar, and also to provide means whereby in the act of opening the door the controlling lever or similar part in the car will be automatically locked.

It is well known that many accidents, often fatal ones, occur through leaving the floor-door open due to the carelessness of the operator or from the fact that the door may be and often is opened from the outside by other persons and in view of this I have devised the mechanism about to be described by which accidents may be entirely avoided both in preventing the door being opened while the car is running and in preventing the car being started while the door is open.

I am aware that there are devices for accomplishing these purposes but my structure is very different from these and has certain advantages over them that will be brought out herein.

In the appended drawings:—Figure 1 is a front elevation of a part of a building floor and the shaft-caging showing the car beyond and slightly raised above said floor. Fig. 1^a shows a door-locking bolt in perspective. Fig. 2 is a side elevation of part of the car and a partial transverse section of the building floor, this figure being drawn on a much larger scale than Fig. 1. Fig. 2^a is a perspective view of a socket member or

keeper carried on the car. Fig. 3 is a plan of a portion of the building-floor showing the car adjacent thereto in part section with certain parts of my mechanism mounted on each. Fig. 4 shows in perspective, a device to be secured on the floor opposite the car. Fig. 5 is an elevation of a cam showing its connection with a locking bolt shown in Fig. 4. Fig. 6 is an end elevation of the same. Fig. 7 is a plan of a device for engaging and holding the lever or other operating device usually carried on the car.

A indicates the floor of the building and B the usual caging shown only in Fig. 1, the usual cable for starting the car by hand or through lever-mechanism to be described being illustrated in said figure and in Fig. 3.

C represents the floor-door and D the car.

Secured on the floor A in the elevator-shaft close to the path of the car, is a casting E having a depending extension F by which to secure it to the floor by means, for instance, of bolts G in Fig. 2. The said casting has two holes indicated at H and J, the former for receiving a locking-bolt K adapted to shift in a horizontal direction within said hole, the latter for receiving a locking-bolt L likewise adapted for horizontal movement. Loosely attached to said bolt L at one end is a lever M which, as shown in Fig. 2, has its fulcrum at N upon the member E, its lower end carrying a roller O. At O' is a spring arranged to bear upon the said lever M to normally hold the locking-bolt L in the path of the door C this position of the bolt being shown in dotted lines in Fig. 2. Upon the top of the casting E immediately above the locking bolt K, are two lugs or ears P carrying a horizontally disposed rock-shaft R. A hub Q upon said rock-shaft carries a cam S constructed in a spiral or helical form substantially as shown in Fig. 5 and its periphery is provided with a groove T adapted to receive a pin U projecting upward from the locking bolt K through a slot V in the top of the casting E.

The end of the shaft R nearest the door C carries a fork W and upon the door is a roller 2 adapted to pass into said fork and for rocking it in both directions. The hub Q has an arm 3 to which is attached a rod 4 the latter extending through an eye 5 at the upper end of a rod 6, said rod being vertically adjustable in a bracket 7 mounted upon the floor, though it is to be understood

that other means of holding and guiding the rod may be used.

Thus far I have described that part of my invention that is secured upon each floor of the building in the elevator shaft. I will now describe those parts that are carried by the car and used in connection therewith.

Fig. 2^a shows a casting 8 secured to the bottom of the car in the position shown in Fig. 2. This is provided with a vertically elongated socket 9 and at one side is an extension 10 whose upper and lower ends are beveled as shown at 11. This said extension lies in the path of the roller O of the lever M which carries the bolt L hereinbefore described, the socket 9 being in line with the locking-bolt K.

In Fig. 2 the car is shown at the floor level and the locking-bolt L is held in its retracted position or out of the path of movement of the door due to the extension 10 so that said door can be shifted on its track to open it. The bevels 11 permit the roller to meet and ride upon the member 10, as the car passes the floor, without injury to any of the parts. The door as it moves along its track carries the roller 2 into the fork W, which normally lies in the position shown in Fig. 1 when the door is closed, and shifts said fork over to the opposite side as clearly indicated in Fig. 3, the roller then passing out of said fork as the door is moved still further toward the wide-open position. This movement rocks the shaft R and turns the cam S about its axis thereby shifting the locking-bolt K laterally of said cam into the socket 9 as shown in Fig. 3.

All elevator cars have some means therein by which the operator can start or stop them and it is my purpose to provide some means in connection with the described mechanism by the use of which said operating means can be held immovable whether it be the lever 21 shown herein, or other sort of device. In this connection it may be stated that for the sake of brevity of description regardless of the specific construction employed I refer to the operating or starting means in some of the claims as a "lever". Also in some of my claims where I employ the phrase "position of rest" I mean that position of the lever where the power to operate the car is cut off.

Figs. 3 and 7 show a member 14 carrying two socket members 16 within each of which is a spring 17. 18 are members secured in a plate 20 attached to the front wall of the elevator and adapted to carry the said socket members 16. The springs 17 hereinbefore mentioned are seated in the sockets of the members 16 and have control of the members 18 such as to normally hold the member 14 away from the lever 21 mentioned above which, when not in use, retains a vertical position so that by a proper move-

ment of the said member 14 it will engage and hold the lever, for instance, by means of a notch 15, see Fig. 7. Upon the plate 20 are ears or lugs 22 between which is pivoted a lever 23 one end having connection through a link 24 with the said member 14, the opposite end extending through a slot 25 in the front wall of the car and having adjustably attached thereto a casting 26 having a depression 27 for receiving the end of the rod 4 hereinbefore described. Simultaneously with the entrance of the locking-bolt K into the socket 9 of the casting 8 by the door-movement, the rod 4 is moved in the direction of its length or parallel to the plane of the door thus carrying its free end against the casting 26 to move the lever 23 and force the member 14 toward the lever 21. When this occurs the operator is powerless to start the car in either direction while the door is open, but upon closing the door the rod 4 is moved to release the operating lever and the locking-bolt K is withdrawn from its socket 9. As a matter of fact, if desired, the locking-bolt K and the member 8 need not be used on the car since by merely employing the member 14 by which to lock the operating lever 21 there is no possible way of moving the car while the door is open.

The act of opening the door is not confined to locking merely the operating lever by the means described since said means may be adapted for locking any other form of car controlling mechanism; this lying, of course, within the meaning of the invention.

Equivalent devices could be substituted, of course, for those described that would accomplish the same results.

Some cars are equipped with operating levers of different forms and some have switch levers, as for instance, such cars as are operated by an electric motor while still other cars are operated merely by means of a cable which the operator grasps by hand and I desire to state that my invention fully contemplates any mechanism the equivalent of that shown by which any of the different forms of levers can be held stationary and immovable while the door is open,

It is to be observed that the socket 9 of the casting 8 is elongated vertically. This is done in order that the car need not be necessarily stopped exactly at the floor level, some little latitude is allowed for this purpose. For instance, if stopped a few inches above or below the floor the bolt may still enter the socket. Likewise the casting 26 on the lever 23 is of some length so that the rod 4 can meet it even though the car is some distance from the floor level and the extension 10 is made long for the same purpose since the locking-bolt L must be retracted at such times in order to permit the door to move.

The invention is applicable to both freight and passenger cars no matter how they may be constructed nor with what form of lever device they may be operated as has been intimated.

It is evident that if the door is always locked when the car is elsewhere than substantially at the floor level and that the car is positively prevented from being started when standing at the floor level when the door is open, there can be no possible chance of accidents occurring. By having the mechanism entirely automatic in its motion the operator has no option in the matter since he cannot open the door without rendering the car operating mechanism immovable nor can he possibly leave the floor level without first closing the door which movement releases the said mechanism.

The structure described herein admits of installing the device upon any make of elevator whatever, and no matter in what position its operating lever may be placed and without regard to the nature of the starting device used. Furthermore in installing the device it is not necessary to in any way mar the floors of the building or damage them in any way; the various parts being bolted in position in a few minutes.

The rod 4 can be made of any length so as to reach the casting 26 whether that member lies close to the fork 7 or some distance from it and it may be readily adapted for locking the operating lever even though the said casting 26 is at one of the other sides of the car from that shown.

Although the member 14 is shown and described as having pivotal connection with the lever 23 it may be a part of the same, if desired, since if the inner arm of said lever within the car were parallel to the wall when the said member 14 is substantially midway between its extremes of movement, the arcuate movement of the member described from the pivot of the lever would be so slight as to have no effect upon it since the socket members 16 would easily admit of such movement due to their large bores as compared to the diameter of the members 18. In fact the lateral movement of the said members 18 in the members 16 would be barely noticeable in the short distance of movement in either direction from the middle position of the said inner arm of the lever.

I am not aware of a mechanism having the simplicity of structure my device possesses nor one having all the advantages arising from such structure.

By having all of those parts of the mechanism that are directly engaged by the door mounted on the floor instead of on the car a perfect operation and definite result is obtained since the door can always positively engage such mechanism there being no va-

riation between it and said door as is the case when part is carried by said car.

The roller 2 of the door in its travel engages one or the other of the arms of the fork thereby moving the rod 4 toward or away from the member 26 in a positive manner and by employing such a lever as is provided by the fork any desired leverage is obtained by making that member of greater or less length and setting the roller 2 higher or lower and in changing the length of the arm 3. From the fact that the arm of the lever 23 on the car can be changed in length, any amount of leverage can be obtained at that point and thus the device can be made to work with a minimum of effort on the part of the operator and in fact the weight of the door in its travel is found to move the parts without the operator being aware of the movement of the locking mechanism.

All of the parts of my device are in plain view of the operator or attendant so that he is always able to watch the working of the mechanism and see that it is in proper operation.

A point to be held in mind is that the door-lock L and the lever holding mechanism 14 and 23 in the car must be used in conjunction in order to obtain the desired result. The door lock of itself would be of no real value if it were not made to work in conjunction with the lever-holding mechanism as otherwise there would be nothing to compel the operator to see that the door is absolutely locked and thus eliminate the danger arising from the door being opened by someone outside the car. But the door-lock is made of the greatest value in entirely eliminating all chance of danger since the door even if ajar will prevent the car being started. When ajar said door will still prevent the mechanism in a position which will prevent the starting lever or controller being moved.

Most if not all of the devices of which I am aware have a member or members extending from the car into the elevator shaft toward the floor door, or from the latter to the former, or both, the movement of these parts being usually in a direction perpendicular to the plane of the door. Owing to the conditions existing in different elevators as to the size of the car relative to the shaft-opening as well as the space between the car and the shaft-wall it is hardly possible to construct a device that will be applicable to all conditions. But in my arrangement in which there is a member such as the lever-arm 23 extending from the car into the shaft to be engaged by a member shiftable in a plane parallel to the plane of the door, any given job may be readily equipped owing to the adjustability of the member 26 on the said arm 23. Also by having the rod 4, which moves in the direction of its length

parallel to the plane of the door, it and the said member 26 can be made to engage. This arrangement admits of fitting the device to any elevator no matter what the conditions may be.

I desire to clearly bring out the fact that contrary to most of the elevator devices of which I am aware the door-operated means carried on the building floor and the means carried on the car which coöperate to bring about the locking of the lever in the car usually move in a plane perpendicular to the plane of the door. In my device, however, the parts that perform the functions stated move parallel to the plane of the door. I am thereby enabled to impart the desired extent of movement thereto and the needed leverages can be supplied much more easily since there is a practically unlimited space in which to arrange for the disposal and movement of the various parts which is not possible in working across the usually limited space between the car and floor-door and in which the extent of movement of the engaging parts is necessarily limited. Further than this, there is greater latitude of adjustment of the engaging parts relatively it being observed by a study of Fig. 3 of the drawings that practically the entire distance between the car and the wall of the shaft can be utilized for the adjustment of the casting 26 upon the lever 23 to place it in the best position for being met by the rod 4, whatever its position is or might be. These parts in moving along the space between the car and wall, instead of across it, are free to have as great an extent of that movement as may be desired. Another advantage in providing for the movement of the casting 26 parallel to the side of the car from which it projects, is that I am enabled to adapt the device to a car where the operating lever is at some other position than at the side opposite the door. The door operated parts and the lever 23 can be placed at any side of the car found necessary and then through suitable members the movements of the door can be transferred to the place from which the said lever 23 projects.

Having thus described the invention, I claim:—

1. In mechanism of the class described, the combination with an elevator-car and its starting lever, of means in the car having provision to engage and hold the lever, and having an extension projecting into the elevator-shaft, the floor-door, a rock-shaft mounted upon the floor of the building and operated by said door, and a rod lying parallel to the door and shiftable in the direction of its length by said shaft through the movement of said door, and adapted to meet the described extension to carry the lever-locking means in the car into engagement with the said starting lever.

2. The combination with an elevator-car and its starting lever, of means in the car to engage and hold the lever and provided with an extension projecting into the elevator shaft, the floor-door, a rocking member on the floor operated by the door as it opens, a rod lying substantially parallel to the path of movement of the door and shifted by the rocking member and adapted to engage the said extension and therethrough control the said starting lever, a support to guide the rod, and a device to automatically operate the first described means to release the starting lever as the door closes.

3. In mechanism of the class described, the combination of an elevator-car, a starting lever for the same, locking means carried by said car to hold the lever in its position of rest and having an extension projecting into the elevator shaft, the floor-door, a rock-shaft journaled on the floor of the building, an arm secured thereon, a single member attached to and moved by the arm in the direction of its length parallel to the door and adapted to engage the said extension to lock the starting lever when the door is open or when it is in the act of opening, and a second arm secured on said rock-shaft adapted to be moved by the door.

4. In mechanism of the class described, the combination of an elevator-car, a starting lever for the same, locking means to hold the lever in its position of rest and having an extension projecting into the elevator shaft, the floor-door, a rock-shaft journaled on the floor of the building, an arm secured thereon, a member attached to and moved by the arm parallel to the door and adapted to engage the extension to lock the lever by the opening movement of the door, a second arm secured on said rock-shaft adapted to be moved by the door, and a member to retract the lever-holding means when and as the door closes.

5. In mechanism of the class described, the combination with the elevator-car and a starting lever, of a single member carried by the car and provided with a recess for receiving said lever at its position of rest, an arm in control of the member and extending into the space between the car and the wall of the elevator-shaft, the floor door, a rock-arm mounted on the building floor and engaged by the door and a member pivoted relatively to the rock-arm and moved by it parallel to the plane of the door to engage the arm.

6. In mechanism of the class described, the combination with the car and its starting device, of means carried on the car to engage and hold the starting device and having an extension projecting into the elevator shaft, the floor-door, and a rod at said door lying substantially parallel to its plane and adapted to move in that plane relative

to and operated by the door to directly engage and move the extension.

7. In mechanism of the class described, the combination with the starting device of an elevator-car, of means carried on the car to engage and hold the same and having an extension projecting into the elevator-shaft adapted when in one position to engage and hold the device, the floor-door, a single rod at the building-floor lying at right angles to the said extension and adapted to be moved in the direction of its length by the door relative to the same and a member to support said rod.

8. In mechanism of the character described the combination with the car and its starting device, of a member carried by the car for engaging said device, a second member carried also by the car and operatively connected with the first, said second member having a free end extending into the elevator-shaft, the floor-door, mechanism in the path of and moved by the door, the same including a member shiftable in the direction of its length in a plane parallel to the plane of the door and adapted to meet and move the free end of the said second member to hold the starting device in its position of rest, and means to automatically disengage the first described member from the said starting device when released in the closing movement of the door.

9. In mechanism of the class described, the combination with an elevator-car, and its starting device, a shiftable member carried on the car adjacent to and adapted to engage and hold the device and having an extension outside the car, the floor-door, a device pivoted on the floor of the building and arranged to rock in a plane parallel to the door and moved by the same, and a single rod attached to the device and also lying parallel to the door and moved in the direction of its length by said door and adapted to engage the said extension.

10. In mechanism of the class described, the combination with a controlling device for an elevator-car, of a shiftable member adjacent to and adapted to engage and hold the same and having an extension outside the car, a support secured upon the building floor adjacent to the elevator-shaft, a rock-shaft mounted therein, a bifurcated arm secured on the shaft, the floor-door, an extension carried by the door to engage the arm for moving it in each direction, and a rod member operated by the arm and adapted to engage the extension of the member within the car.

11. In mechanism of the class described, the combination of the car, a starting device therein, means to engage and lock the same and having an extension projecting from the car, a standard mounted upon the floor of the building, a rock shaft carried by the

standard, an arm carried by the shaft, a rod pivotally attached thereto and adapted to engage the extension, a vertically adjustable standard mounted also upon the building floor for guiding the rod, the floor-door, and means on the rock-shaft with which the door engages in its travel to move the rod into engagement with the said extension.

12. In mechanism of the class described, the combination of an elevator-car, a starting-device therein, means carried by the car and adapted to engage the said device and having an extension projecting into the elevator-shaft, a member mounted on the building floor, a rock-shaft carried therein, a forked arm secured to the shaft, a floor door adapted to move said arm, an arm on the shaft extending substantially at right angles to the said extension of the car, a rod pivoted to the arm, and a guide for the rod.

13. In mechanism of the character described, the combination of the car, a starting device therefor, a member carried by the car for engaging said device, an arm also carried by the car and operatively engaging the member and extending into the elevator shaft, a bifurcated arm mounted on the building floor, the floor-door, an extension on the latter to engage said rock-arm and move it in both the opening and closing movement of said door, and a device positively moved by the rock-arm to engage the first described arm to hold the starting device immovable when and as the door is opened and for drawing said device away from said first arm in the closing movement of said door.

14. In mechanism of the character described, the combination with the car, and its starting device, a member carried by the car for engaging said device, an arm also carried by the car and operatively engaging the member and extending into the elevator shaft, a bifurcated rock-arm mounted on the building-floor, the floor door, an extension on the latter to engage said rock-arm in both the opening and closing movement of said door, a means positively moved by the rock-arm to engage the arm in the car to engage and hold the starting means immovable when and as the door is opened and for drawing said device away from said arm, and means to automatically release the starting device in the closing movement of the door.

15. In mechanism of the character described, the combination with the car, and its starting device, a member on the car for embracing said device, means for normally holding the member disengaged therefrom, a lever fulcrumed on the car and connected to said member and having a free end extending into the elevator-shaft and provided with a vertical extension, a bifurcated rock-

arm pivotally supported at the floor of the building, the floor-door, an extension on the floor-door for engaging the arm to rock it positively in both directions, and a rod positively shifted by the arm and adapted to engage the vertical extension of the said lever in the opening movement of the door for the purposes set forth.

16. The starting device of an elevator-car, a lever pivoted on the car and projecting into the elevator-shaft and provided with means at its inner end to engage the starting-device and having at its outer end an extension of some length having a surface disposed substantially in a vertical plane, in combination with a floor-door, a rock-arm controlled by said door, and a member having movement in the direction of its length parallel to the plane of the door and operated by the arm and adapted to engage the said vertical surface of the arm-extension.

17. The combination with an elevator-car, its starting device, and the floor-door, of means to engage and hold said device in its position of rest including an arm to directly operate said means, said arm having a free end extending into the elevator-shaft and provided with a vertically disposed portion of some length the plane of whose working surface is substantially perpendicular to the plane of the door, and a rod operated by the door and having movement parallel to it and having a free end adapted to abut against the said vertical portion to move it parallel to the said door.

18. The combination with an elevator-car, its starting device and the floor-door, of means to engage and hold said device in its position of rest including an arm to directly operate said means, the same having a free end within the elevator-shaft and provided with a vertically disposed portion of some length, the plane of whose working surface is substantially perpendicular to the plane of the door, and means carried on the building floor and moved by the door in a plane parallel to its own plane and adapted to abut against the said vertical portion and move it in the same direction therewith.

19. The combination with an elevator-car and its starting device, of means to engage and hold said device in its position of rest including an arm to directly operate said means and extending into the elevator-shaft, a member adjustable upon the arm and provided with a substantially vertically disposed surface of some length, the floor-door, and a member movable in the direction of its length parallel to the plane of the door and operated by said door and adapted to engage said member.

20. The combination with an elevator-car and its starting device, of means carried by the car adapted to engage and hold said device in its position of rest, the floor-door

having an extension, a fork mounted near the door to have movement parallel to the plane of that member and adapted to receive the door-extension between the arms thereof, a part operated by the fork, and a member pivotally connected with said part and moved by the latter parallel to the plane of the door into engagement with the said means.

21. The combination with an elevator-car, its starting means, and the floor-door, of a member operated by said floor-door when opened to engage and immovably hold the said starting means, a rock-arm operated by the door, a locking-bolt to engage the car, and a cam operated by the rock-arm and engaging the bolt to positively shift it as the door is opened or closed for the purposes set forth.

22. The combination with an elevator-car, its starting means, and the floor-door, of a member operated by said floor-door, in its opening movement, to engage and immovably hold the said starting means, a rock-arm operated by the door, a locking-bolt to engage the car, a cam operated by the rock-arm and engaging the bolt and positively shifted as the door is opened or closed, and means for removing the member from the starting means when the door is closed.

23. In mechanism of the class described, the combination with an elevator-car, its starting device, and a movable member on the building floor, of mechanism in the car to engage the said starting device including a part extending from said car, a rocking part mounted on the building floor adapted to be moved by the first said member, and means moved by and relative to the said rocking part to engage the part extending from the car.

24. The combination with an elevator-car and its starting lever, and the elevator-door, of a member movable in a plane perpendicular to the plane in which the lever moves and adapted to engage and hold the same, a member on the car to directly move the first said member into engagement with the lever and extending into the elevator-shaft and adapted to swing in a plane parallel to the side of the car from which it projects, and means separate from the car and door and operated by the latter to move the first said member.

25. The combination with an elevator-car and its starting lever, of a member movable in a plane perpendicular to the plane in which the lever moves and adapted to engage and hold said lever, and means carried on the car one of whose ends is directly connected with said member to operate it, its other end extending into the elevator shaft and movable parallel to the side of the car from which it projects.

26. The combination with an elevator-car

and its starting lever, of a device movable in a plane perpendicular to the plane in which the lever moves and adapted to engage and hold said lever, means carried on the car one of whose ends carries said device, and adapted to move the same to engage the lever, its other end extending into the elevator shaft and movable parallel to the side of the car from which it projects, the floor-door and a member carried on the building floor parallel to said door and moved by it parallel to said door to directly engage and move said means.

27. The combination with an elevator-car, its starting lever and a floor door, of a device movable in a plane perpendicular to the plane in which the lever moves and adapted to engage and hold said lever, means carried on the car one of whose ends carries said device and adapted to move the same to engage the lever, its other end extending into the elevator shaft and movable parallel to the plane of movement of the said floor door, and a member carried on the building floor and lying parallel to the plane of, and moved by and parallel to said door to directly engage and move the said means.

28. The combination with an elevator-car and its starting lever, of means in the car to directly engage said lever, the floor-door, and means on the building floor moved by and parallel to the door adapted to directly engage and impart movement to the means in the car to carry it into engagement with said lever.

29. The combination with an elevator-car, its starting lever and a floor door, of means carried by the car to engage the lever and having a part coacting with it extending into the elevator shaft and adapted to move bodily parallel to the plane of the door, and means carried on the building floor and moved by and parallel to said floor door adapted to engage and impart movement to the extended portion of the said means on the car.

30. In combination with an elevator-car, its starting lever and a floor door, of a member in the car to engage the said starting lever, a crank arm to one end of which said member is pivoted, the other end of said crank arm projecting into the elevator shaft, the ends of the said crank arm moving in planes perpendicular to one another, one of them moving parallel to the line of movement of the floor-door, and means positively operated by said door to engage the projecting arm.

31. In combination with an elevator car, its starting lever and a floor door, of a member in the car to engage the said starting lever, a crank-arm pivoted in the car one of its ends carrying the member, its other end projecting into the elevator shaft and adapted to swing in a plane parallel to the line

of movement of the door, a member adjustable thereon across the space between the car and the door, and means carried on the building floor and movable parallel to and operated by the door to engage the adjustable member.

32. In combination with an elevator car, its starting lever and a floor door, of a member in the car to engage the said lever, a crank arm pivoted in the car one of its ends carrying the member, its other end projecting into the elevator shaft and adapted to swing in a plane parallel to the line of movement of the door, a member adjustable thereon across the space between the car and the door, a rock-shaft mounted on the building floor, an arm carried by it to rock in a plane parallel to the door, a rod attached to it and adapted to engage the adjustable member, a fork mounted on the shaft and an extension on the door to engage the fork.

33. The combination with an elevator car, control mechanism mounted thereon and a locking device for said control mechanism, and the floor door of an elevator shaft, of a forked member mounted on the floor of the building adjacent to the said door, an extension on the door to engage the member and positively shift it in both directions, and a member positively moved by and with the fork and having movement relative to it and said door in a plane parallel to the plane of the latter and arranged to control the locking and unlocking of said control mechanism.

34. The combination with an elevator car, control mechanism mounted thereon and a locking device for said control mechanism, and the floor door of an elevator shaft, of a forked member mounted on the floor of the building adjacent to the said door, an extension on the door to engage the member and positively shift it in both directions, said forked member including an arm, and a member pivotally attached to the arm and moved thereby in the same direction with the fork and movable parallel to it and the door and arranged to control the locking and unlocking of said control mechanism.

35. The combination with an elevator car, control mechanism mounted thereon and a locking device for said control mechanism, and the floor door of an elevator shaft, of a forked member mounted on the floor of the building adjacent to the said door, an extension on the door to engage the member and positively shift it in both directions, and a member positively moved by and with the fork and having movement relative to it and said door in a plane parallel to the plane of the latter, and a part to support and guide the last named member and arranged to control the locking and unlocking of said control mechanism.

36. The combination with the starting lever of an elevator car, of a member mount-

ed in the car and provided with a recess in its face opposite to the said lever, means constantly tending to hold the member free of the latter, and an arm pivoted on the car and pivoted to and having direct control of the member and adapted to move it to engage said lever.

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

SOLOMON M. MILLER.

Witnesses:

L. M. THURLOW,

C. C. VANCE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."