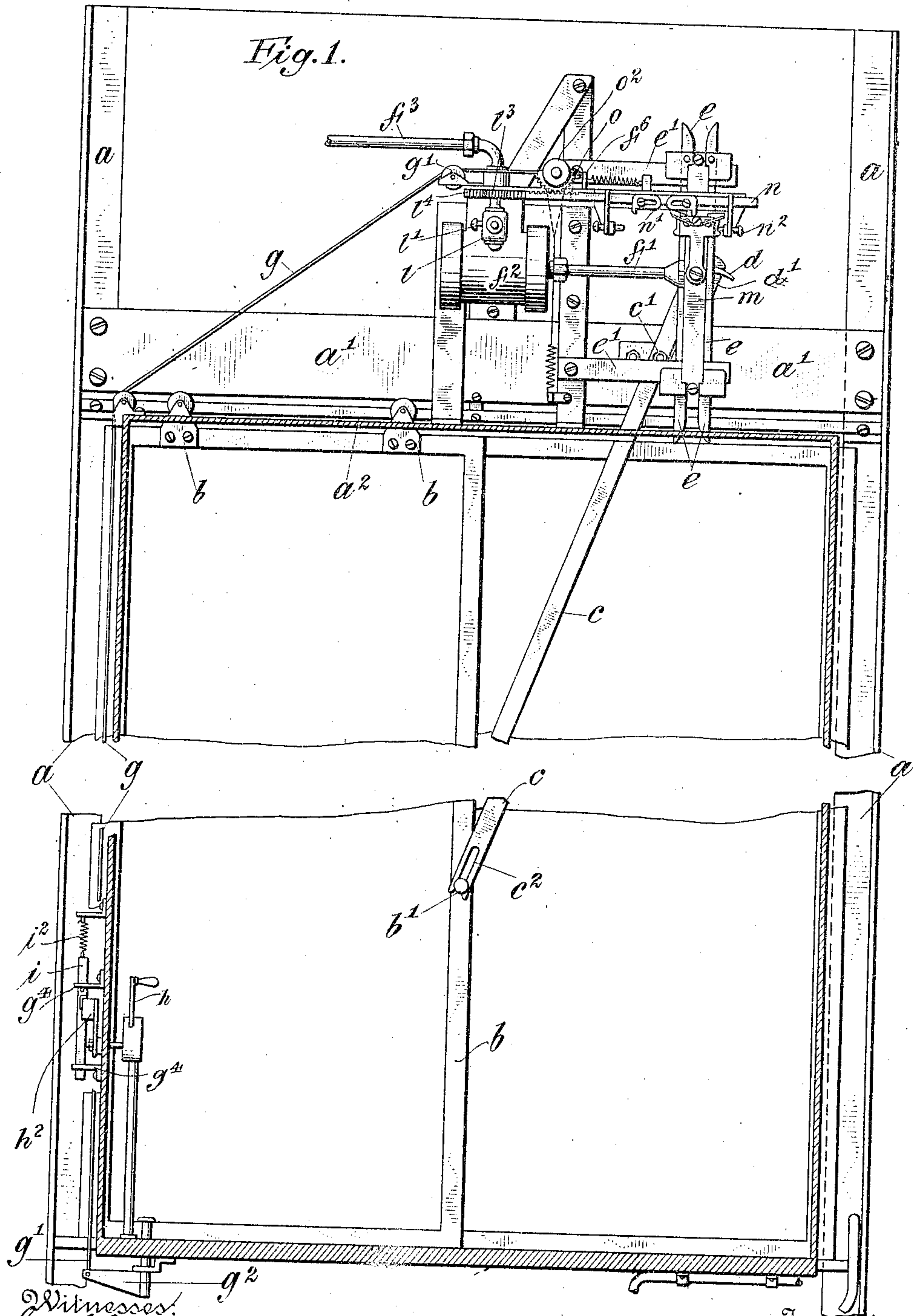


C. L. GRUHN.
 DEVICE FOR OPERATING ELEVATOR DOORS.
 APPLICATION FILED OCT. 22, 1908.

935,103.

Patented Sept. 28, 1909.

3 SHEETS—SHEET 1.



Witnesses:
 Geo. Schwarz.
 A. L. Kelly

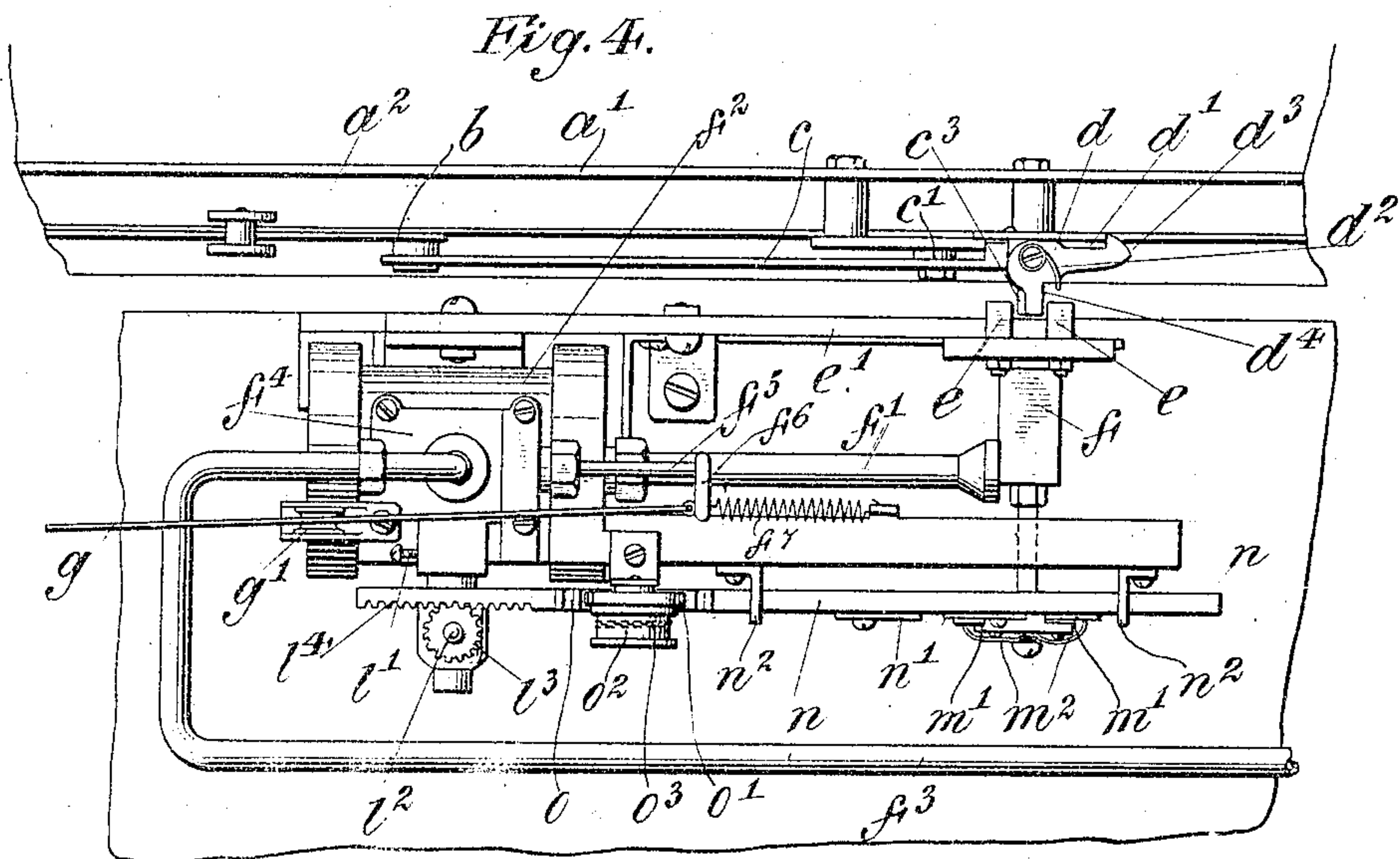
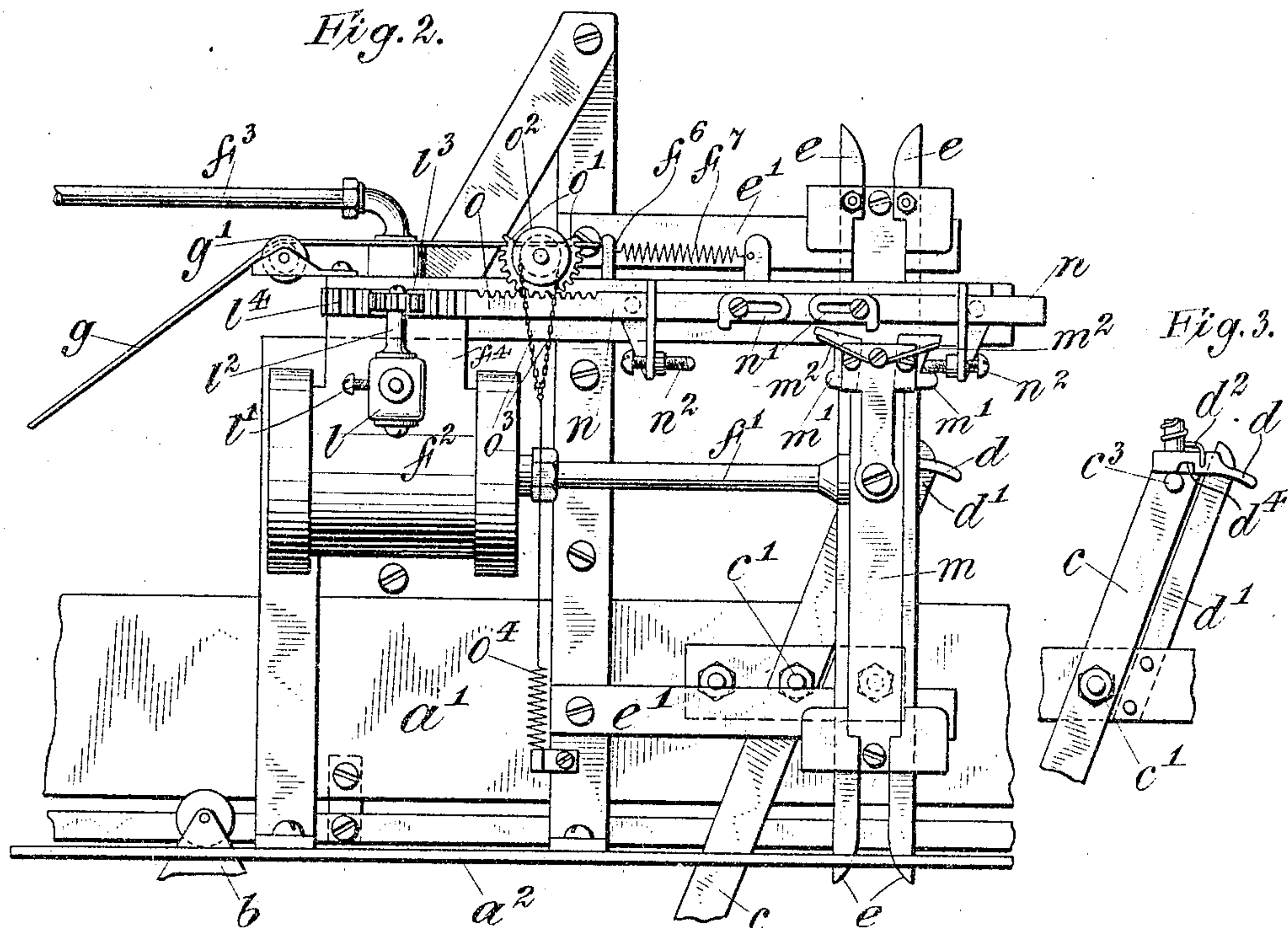
Charles L. Gruhn Inventor
 By his Attorneys
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3 SHEETS—SHEET 2.



Witnesses:
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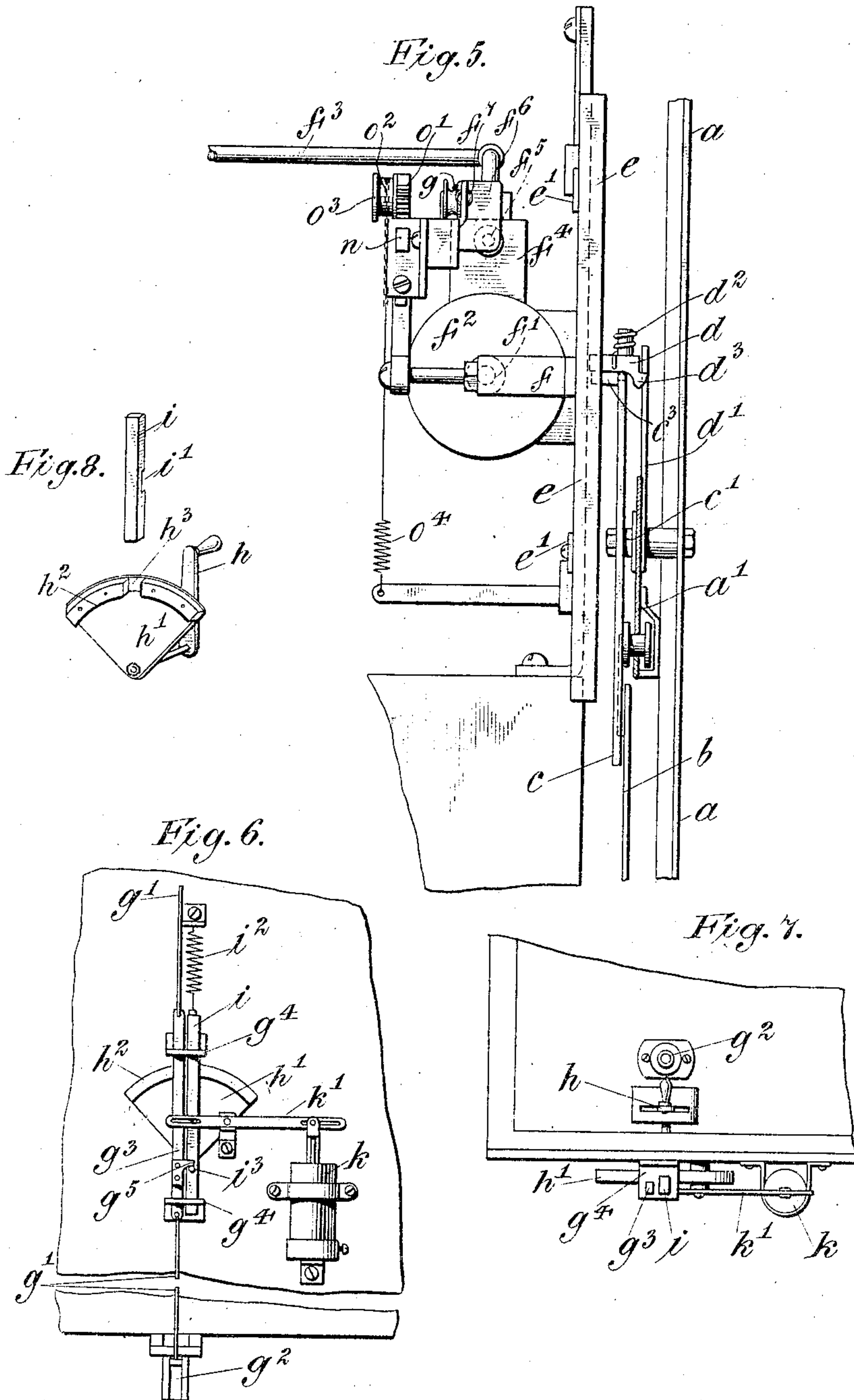
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3 SHEETS—SHEET 3.



Witnesses:
Geoffrey
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UNITED STATES PATENT OFFICE.

CHARLES L. GRUHN, OF NEW YORK, N. Y.

DEVICE FOR OPERATING ELEVATOR-DOORS.

935,103.

Specification of Letters Patent. Patented Sept. 28, 1909.

Application filed October 22, 1908. Serial No. 458,940.

To all whom it may concern:

Be it known that I, CHARLES L. GRUHN, a citizen of the United States, residing in the borough of Manhattan, of the city of New York, in the State of New York, have invented certain new and useful Improvements in Devices for Operating Elevator-Doors, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

This invention has relation to devices for opening and closing elevator doors, that is, doors or gates for the openings through which ingress and egress of persons to and from elevator cars is afforded. Such doors are usually under the control of the elevator conductor or operator and are usually placed in the wall of the elevator shaft, each door being opened and closed while the elevator car is at rest at the corresponding level. It is with the operation of such doors in the walls of elevator shafts that the present invention is particularly concerned, although some parts of the improved mechanism are applicable to the operation of the doors of elevator cars.

One object of the invention is to provide improved means whereby only a single set of operating devices is required for the operation of all of the doors of an elevator shaft.

Another object is to provide improved means whereby the opening and closing of the doors may be conveniently effected at the will of the elevator conductor.

Another object is to provide improved means whereby the opening of any door is wholly under the control of the operator and cannot take place except when the car is at the corresponding floor level.

Another object is to provide improved means whereby the car cannot be started from any floor level except when the door is fully closed.

The general object of the invention is to improve and perfect the door operating and controlling mechanism in various details, whereby such devices are rendered more efficient and certain in operation.

The invention will be more fully explained hereinafter with reference to the accompanying drawings in which the application of the invention to an ordinary elevator is illustrated in a convenient and practical form, and in which—

Figure 1 is a view in elevation, partly broken out to save space, showing a portion of the elevator car with its controlling devices, the door operating mechanism carried by the car, a portion of an elevator shaft or shaft frame, and a shaft door. Fig. 2 is a view in elevation, on a larger scale than Fig. 1, of the door operating devices carried by the car, the door operating lever and its fulcrum on the shaft frame being also shown in part. Fig. 3 is a detail view showing the door operating lever and its locking device. Fig. 4 is a top view of the parts shown in Fig. 2. Fig. 5 is a view in elevation of the parts shown in Fig. 2 as seen from the right in said figure. Figs. 6 and 7 are respectively a detail view in elevation and a detail top view of the controlling devices mounted on the car. Fig. 8 is a detail view of a portion of the locking devices by which the starting of the car is prevented or permitted.

The construction of the elevator shaft, the car and the door or gate may all be as usual or preferred. In Figs. 1 and 5 of the drawings, the shaft uprights a are shown as supporting a crossbar a' , shown also in Figs. 2 and 4, which carries the fulcrum of the door operating lever hereinafter referred to, and a track or rail a^2 upon which may be hung, in any suitable manner, the door b , which, in the present instance, is adapted to close the door when in the wall of the elevator shaft. A door operating lever c is shown as fulcrumed at c' upon the bar a' and as forked or slotted at its lower end, as at c^2 , to engage a stud b' on the door b . On its upper and shorter arm, the lever c , in the arrangement shown, carries a stud c^3 (Figs. 3, 4 and 5) for engagement by the door operating bars or fingers hereinafter described, and a latch d by which the door is locked in its closed position. The latch d is pivotally mounted on the lever c , on a vertical axis and is adapted to engage a fixed latch plate d' carried by the cross-bar a' . The latch d is caused by a suitable spring d^2 to engage the latch plate d' , the nose d^3 of the latch plate being suitably cam shaped, as shown in Fig. 4, to engage the fixed latch plate d' when the lever returns to normal or closed position. The latch is also provided with a lateral projection or lug d^4 , also adapted for engagement with one of the door operating bars or fingers, hereinafter referred to, during the first part of the movement of such door

operating bar or finger and before the stud c^3 is engaged thereby, so that the latch shall be caused to release the door operating lever, and therefore the door, before the opening movement of the lever begins.

The vertical door operating bars or fingers e, e , are mounted to slide horizontally upon suitable guide ways e' , supported by suitable frame work on the elevator car. They are of such length as to effect the opening of the door if the car floor is not exactly on a level with the corresponding floor of the building but is a few inches above or below the same. They are placed apart so as to pass freely on opposite sides of the stud c^3 and lug d^4 , above mentioned, and also have their upper, and lower ends suitably cam shaped to accommodate any minor irregularities of alinement. When a door is to be opened, horizontal movement is imparted to these bars or fingers in one direction, one of such bars first engaging the lug d^4 of the latch d to release the lever c and then engaging the stud c^3 of the lever c to swing such lever upon its fulcrum and open the door. When the door is to be closed a movement in the opposite direction is imparted to the bars or fingers and the other of such bars or fingers engages the stud c^3 of the lever c^4 to swing the latter upon its fulcrum and close the door. It will be understood that the horizontal movement of the bars or fingers effects the opening or closing movement of the lever c which, at the time of such movement of the bars or fingers, has its stud c^3 standing between the bars or fingers, and that the one set of operating devices, therefore, serves for the opening and closing of any of the doors of the elevator shaft.

Various means might be employed for imparting to the bars or fingers e the required horizontal movement, but in the arrangement shown in the drawings the bars or fingers e are actuated, through a stud f , by a piston rod f' , of a double acting cylinder f^2 , to which air or other fluid under pressure may be supplied from any suitable source through a supply pipe f^3 . The admission of air or other fluid under pressure to one end or the other of the cylinder f^2 is controlled by an ordinary slide valve, sufficiently indicated at f^4 , the stem f^5 of which has a finger f^6 to which is connected a spring f^7 to draw the valve stem in one direction. The valve stem is also connected to suitable controlling devices conveniently placed on a car for operation by the conductor. In the arrangement illustrated in the drawings a cord or chain g , connected to the valve stem f^5 through the finger f^6 , is led over suitable guide sheaves g' to a manually operated device in convenient reach of the conductor, the same being, in the present instance, a foot press g^2 , shown in Figs. 1, 6 and 7. For convenient and more efficient operation

a sliding bar g^3 , moving in suitable guides g^4 , is interposed between two parts of the chain or cord g' . It will now be seen that movement of the foot press g^2 effects such movement of the valve f^4 as is necessary to admit the air or other fluid under pressure behind the piston in the cylinder f^2 at that end of the cylinder at which the fluid under pressure must be admitted in order to open the door. When the pressure on the foot press g^2 is relieved, the spring f^7 shifts the valve to the position necessary to effect the admission of air at the other end of the cylinder, whereby the piston is moved to close the door.

In order to guard against accidents, it is desirable to prevent the starting of the car so long as the door is open or until it is fully closed. To this end, the movement of the devices which control the opening of the door, as of the foot press g^2 , is made to lock the controlling mechanism of the car against operation. The precise form of devices for accomplishing this result will be varied according to the nature of the devices for controlling the opening of the door and the nature of the devices for controlling the movement of the car. In the arrangement shown in Figs. 1, 6, 7 and 8, the car controlling lever h , by which the conductor controls the movement of the car, is shown as carrying with it a quadrant h' which has a rim or flange h^2 with a notch h^3 through which, when the controlling lever h is in its normal position, with the car at rest, a locking bar i may move freely. Such locking bar also has a notch i' which, when the valve f^4 is in position to permit the door to close, registers with the rim or flange h^2 , so that, under such conditions, that is, with the door closed, the controlling lever can be moved to start the car up or down, while if the valve is in such position as to cause the door to open, the bar i prevents the movement of the controlling lever to start the car in either direction, the notch i' then standing out of registration with the rim h^2 . The bar i is shown as mounted to slide in the guides g^4 parallel with the bar g^3 . It is normally drawn upward by a spring i^2 and is drawn downward out of normal position, to lock the controlling devices, when the door is open or is about to open, by a finger g^5 on the bar g^3 which overlies a pin i^3 on the bar i . Movement of the foot press g^2 , to cause the door to open, therefore moves the locking bar i to lock the controlling lever h against movement and when the pressure on the foot press g^2 is relieved, to permit the door to close, the locking bar i is drawn upward by the spring i^2 to release the controller. In order that the door may close completely before the controller is released, the movement of the locking bar to release the controller is retarded. As a convenient means

for this purpose a dash pot k , of usual construction, is shown as connected to the locking bar i through a lever k' .

In order to prevent the opening or closing of the door with a sudden shock it is desirable to cushion the movement of the door as it approaches its fully open position and its fully closed position. For this purpose, in the form of construction represented in the drawings, in which the door is actuated by a fluid under pressure, this result is accomplished by closing the cylinder exhaust just before the door reaches either extreme position. The cylinder f^2 is provided with an exhaust valve, of ordinary construction, as indicated at l , and with a regulating vent screw l' , between the cylinder and the valve. Provision is made whereby the valve l , normally open, is closed just before the door reaches its extreme closed and its extreme open position, the closing of the valve being effected by some part which partakes of the movement of the door, either directly or preferably indirectly. In the construction shown this result is accomplished by the movement of the cross-head m carried with the bars or fingers e , through the following described devices. The stem l^2 of the valve l carries a pinion l^3 which is in mesh with a rack l^4 on a sliding bar n . On the bar n are carried adjustable lugs or catches n' and on the supporting frame are carried adjustable stops n^2 . Mounted on the cross-head m are two lever latches m' , held normally by corresponding springs m^2 in position to engage the corresponding lug or catch n' , but adapted to be disengaged therefrom through contact of the tails of the latches with the corresponding adjustable fixed stops n^2 . It will now be seen that when the cross-head m , partaking of the movement of the door, moves to the left of the position shown in Fig. 2, the latch m^2 , as the door approaches its extreme open position, will strike the left hand catch n' on the sliding bar n and will cause the latter to move sufficiently to close the exhaust valve l through the engagement of the rack l^4 with the pinion l^3 on the stem of the valve, thereby preventing the escape of such motive fluid or air as remains in the end of the cylinder toward which the piston is moving, except such as is permitted to escape slowly by the regulating vent l' , and thereby cushioning the movement of the piston and therefore the movement of the door. Just as the door reaches its extreme position the tail of the latch m^2 will make contact with the stop n^2 and the latch will thereby be disengaged from the catch n' and the bar n released and permitted to return to normal position and thereby open the exhaust in readiness for another movement of the door. Any suitable means may be provided for returning the exhaust valve to its normal or open

position after it has been closed and released as just described, a convenient means comprising a spring or weight being connected directly or indirectly to the stem of the exhaust valve to return it to normal position. In the construction shown the sliding bar n is provided with a second rack o which is engaged by a segmental gear o' mounted upon a suitable axis and carrying with it a drum o^2 . A bridle o^3 is connected to the drum o^2 and to a spring o^4 , which spring acts through the bridle, drum, gears and sliding bar to rotate the valve stem l^2 back to normal position as soon as it is released, whether it has been turned in one direction or the other to close the exhaust.

In the operation of the mechanism shown in the drawings it will be understood that as the elevator car approaches a floor at which a stop is to be made, the bars or fingers e pass on opposite sides of the stud c^3 on the door lever c and the lug d^4 of the latch d , stopping with the stud and lug between them. Until the elevator controlling lever h is brought to the position of rest, it is impossible for the conductor to open the door because the rim h^2 of the quadrant h' stands in the notch i' of the sliding bar i and the latter, through the pin i^3 and finger g^5 , holds the sliding bar g^3 and its connections from movement. When, however, the controlling lever is brought to the position for stopping the car, the bar i is free to move and the conductor may then depress the foot press g^2 and, through the described connections, open the valve f^4 to admit air or other motive fluid behind the piston. The first movement of the bars e with the piston disengages the locking latch d and the continued movement then swings the lever c upon its axis and opens the door. The movement of the sliding bar g^3 to open the door carries with it the sliding bar i , thereby moving the notch i' therein out of alignment with the rim h^2 and so preventing movement of the controlling lever in either direction to start the car up or down. As soon as the conductor is ready to permit the door to close he releases the foot press g^2 and the spring f^7 then moves the valve f^4 so as to admit air to the other end of the cylinder and close the door. As the bar i , slowly rising under the action of the spring i^2 and the dash pot k , reaches its normal position, the notch i' therein comes in registration with the rim or flange h^2 of the quadrant h' and so releases the controller. As the door closes the latch d automatically engages the fixed catch d' , thereby holding the door securely locked until it is again opened from the interior of the car.

It will be understood that details of construction and arrangement of the improved mechanism may be varied to suit different conditions of use and that some of the de-

5 vices are capable of useful application independently of others. The invention, therefore, is not limited to the precise construction and arrangement of parts shown and described herein.

I claim as my invention:

10 1. In an elevator the combination of a movable shaft door, a stud in operative relation with the door vertical parallel bars mounted on the car and movable horizontally and adapted to pass on opposite sides of the stud as the car moves, and means to move said bars horizontally to open the door as the car is in position opposite thereto.

15 2. In an elevator the combination of a movable shaft door, a latch in operative relation with the door to hold the same closed and having a projecting lug, a car, vertical parallel bars mounted on the car and movable horizontally and adapted to pass on opposite sides of said lug and means to move said bars horizontally to disengage said latch as the car is in position opposite the door.

20 3. In an elevator the combination of a movable shaft door, a stud in operative relation with said door, a latch in operative relation with said door and having a projecting lug, a car, vertical parallel bars mounted on the car and movable horizontally and adapted to pass on opposite sides of the door stud and the latch lug and means to move said bars horizontally to release the latch and open the door.

30 4. In an elevator the combination of a movable shaft door, a door lever mounted on the shaft wall and engaging the door and having a stud, a car, vertical parallel bars mounted on the car and movable horizontally and adapted to pass on opposite sides of said stud and means to move said bars when the same are in engagement with the stud to open the door.

40 5. In an elevator the combination of a movable shaft door, a door lever mounted on the shaft wall and engaging the door, a latch cooperating with the lever to hold the door closed and having a projecting lug, a car, vertical parallel bars mounted on the car and movable horizontally and adapted to pass on opposite sides of said lug and means to move the bars to disengage said latch while the bars are in engagement with said lug.

50 6. In an elevator the combination of a movable shaft door, a stud in operative relation therewith, a car, vertical parallel bars mounted on the car and movable horizontally and adapted to pass on opposite sides of said stud, a motor cylinder for said bars also carried on the car, and means carried on the car for controlling the admission of motive fluid to said cylinder.

60 7. In an elevator the combination of a movable shaft door, a fluid pressure cylinder

in operative relation with the door to move the same, a valve to control the admission of motive fluid to the cylinder, yielding means acting to hold the valve normally in position to effect the closing of the door, a car, and means on the car under control of the operator to shift the valve to effect the opening of the door. 70

8. In an elevator the combination of a movable shaft door, a fluid pressure cylinder in operative relation with the door to move the same, a car, means on the car to control the admission of motive fluid to the cylinder, an exhaust valve for the cylinder and means to close the exhaust valve as the door approaches the limit of its movement to cushion such movement. 75 80

9. In an elevator the combination of a movable shaft door, a fluid pressure cylinder in operative relation with the door to move the same, a car, means on the car to control the admission of motive fluid to the cylinder, an exhaust valve for the cylinder, a movable part partaking of the movement of the door and connections whereby said movable part is made to close the exhaust valve as the door approaches the limit of its movement. 85 90

10. In an elevator the combination of a movable shaft door, a fluid pressure cylinder in operative relation with the door to move the same, a car, means on the car to control the admission of motive fluid to the cylinder, an exhaust valve for the cylinder, a cross-head carried by the piston rod of the cylinder, a sliding bar and connections to close the exhaust valve, and devices carried by the cross-head and adapted to engage the sliding bar to close the valve as the door approaches the limit of its movement. 95 100 105

11. In an elevator the combination of a movable shaft door, a fluid pressure cylinder in operative relation with the door to move the same, a car, means on the car to control the admission of motive fluid to the cylinder, an exhaust valve for the cylinder, a cross-head carried by the piston rod of the cylinder, a sliding bar and connections to close the exhaust valve, and a latch carried by the cross-head and adapted to engage the sliding bar as the door approaches the limit of its movement. 110 115

12. In an elevator the combination of a movable shaft door, a fluid pressure cylinder in operative relation with the door to move the same, a car, means on the car to control the admission of motive fluid to the cylinder, an exhaust valve for the cylinder, a cross-head carried by the piston rod of the cylinder, a sliding bar and connections to close the exhaust valve, a latch carried by the cross-head and adapted to engage the sliding bar as the door approaches the limit of its movement, means to disengage said latch from the sliding bar and means to restore 120 125 130

said sliding bar to normal position to open the exhaust valve.

13. In an elevator, the combination of a movable shaft door, operating devices for closing and opening said door, a car, a car controller, door controlling devices mounted on the car and in operative relation with said door operating devices, a locking bar movable with the door controlling devices in one direction and movable independently thereof in the opposite direction and cooperating with the car controller to prevent movement of the car controller on the door controlling devices except when the other of such parts is in normal position, and means to retard the movement of the locking bar when moving independently of the door controlling devices.

14. In an elevator, the combination of a movable shaft door, operating devices for closing and opening said door, a car, a car controller, a locking bar movable by the door controlling devices in one direction and cooperating with the car controller, yielding means to move the locking bar in a direction opposite to that in which it is moved by the door controlling devices, and a dash pot

connected to the locking bar to retard the movement thereof.

15. In an elevator, the combination of a movable shaft door, operating devices for closing and opening said door, a car, a car controller, a quadrant having a notched rim movable with the car controller, door controlling devices mounted on the car and in operative relation with said door operating devices, a notched sliding bar movable with the door controller in one direction and cooperating with the quadrant to prevent movement of either the car controller or the door controlling devices except when the other is in normal position, yielding means to move the notched sliding bar in a direction opposite to that in which it is moved with the door controller and means to retard the movement of said sliding bar in the direction last mentioned.

This specification signed and witnessed this 12th day of October, A. D., 1908.

CHARLES L. GRUHN.

Signed in the presence of—

ELLA J. KRUGER,

AMBROSE L. O'SHEA.