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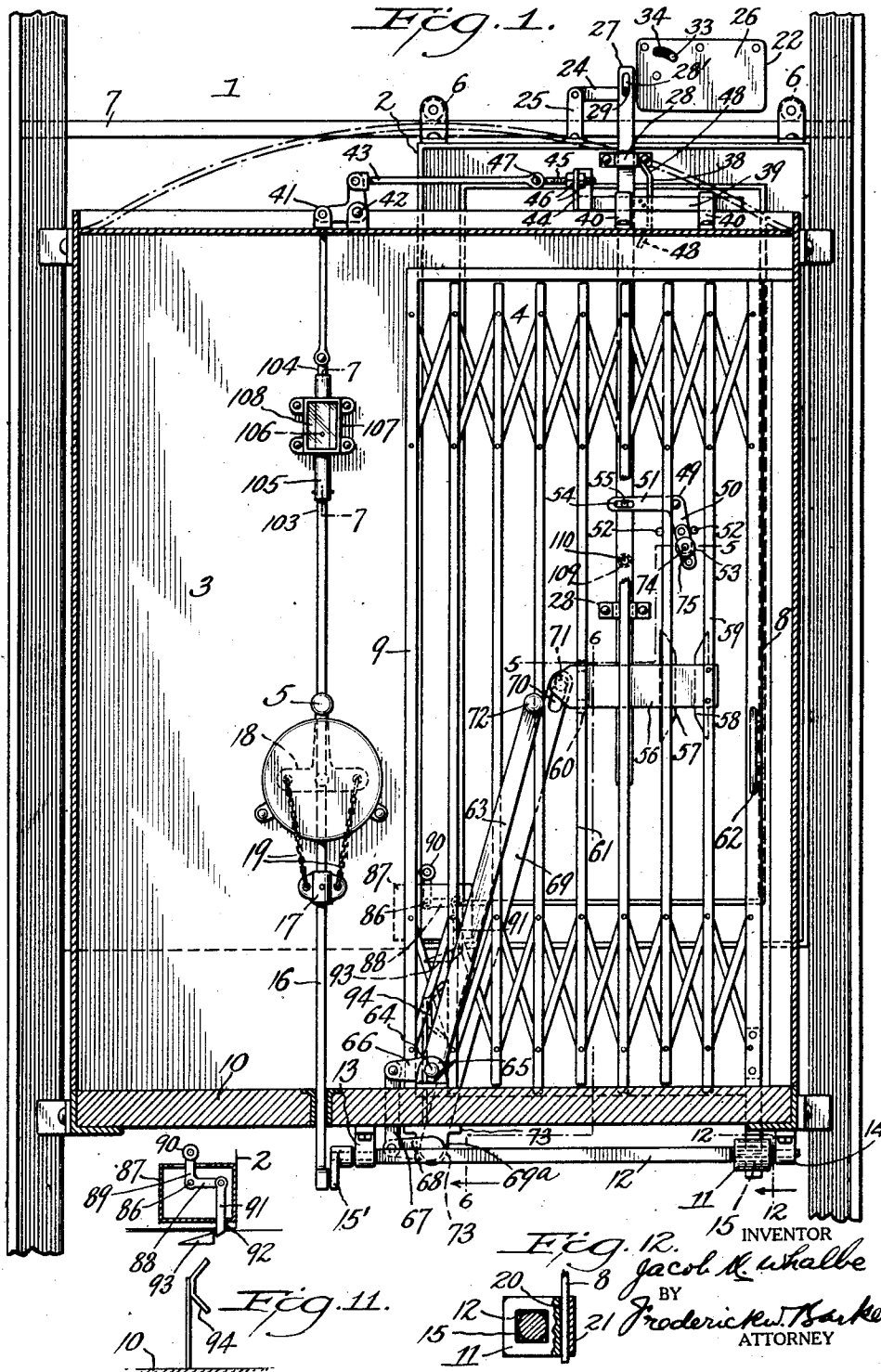
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ELEVATOR

Filed August 11, 1925

2 Sheets-Sheet 1



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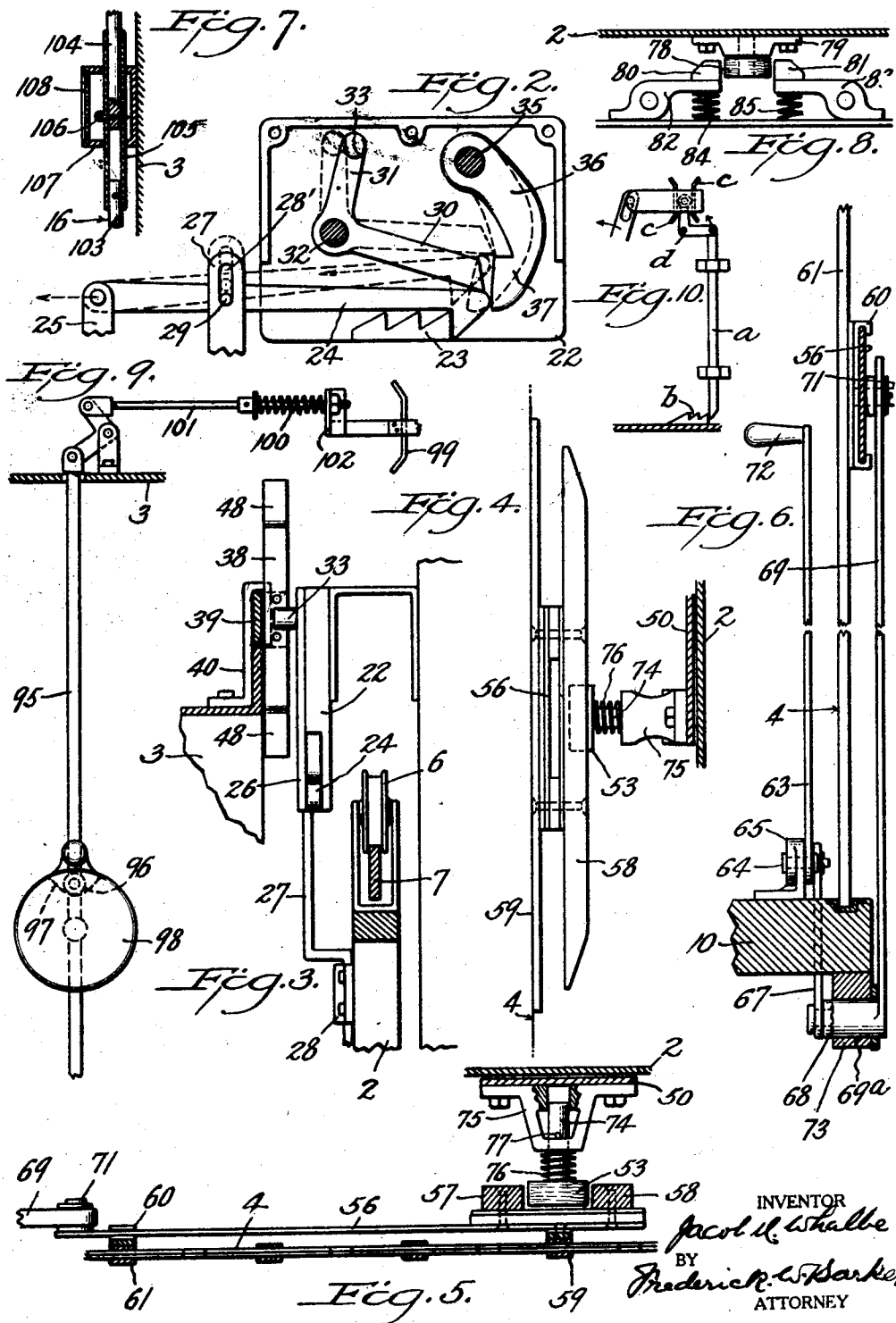
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE.

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ELEVATOR.

Application filed August 11, 1925. Serial No. 49,543.

This invention relates to elevators, and my improvements are directed to certain mechanisms whereby the shaft doors and car gate are coordinated in their operation and are held locked while the car is moving between floors, said mechanisms however permitting the locking means to be released for the car gate and the door of a shaft landing at which a car has come to rest.

Also my improvements include means for automatically locking the car control, with the power off, when the car has reached a shaft landing and the locks for the shaft door and car gate have both been released, this control lock remaining effective during the period in which the shaft door and car gate have been opened and until again closed and locked in their closed positions.

In my earlier Patent No. 1,417,873, dated May 30, 1922, there are disclosed other mechanisms for the safety operation of elevators, and my present invention may be regarded as in the nature of a development of my original conception, wherein the parts employed have been simplified and their performance rendered more positive.

Still further my present invention includes other ancillary features permitting independent operation of the shaft doors and car gate to be performed as emergency provisions, as for example in the event of a car becoming stalled between floors.

Other features and advantages of my invention will hereinafter appear.

In the drawings:

Figure 1 is an interior view of a car, looking toward the front thereof, said car located in a shaft, the view showing the car gate, a shaft door, the car control, and my improved locking and lock releasing mechanism.

Fig. 2 is an enlarged detail view of the locking and lock releasing mechanism for the shaft door.

Fig. 3 is an enlarged detail side sectional view showing the support for a shaft door.

Fig. 4 is a detail of the mechanism for co-ordinating the opening and closing movements of the car gate and shaft door.

Fig. 5 is a section on the line 5—5 of Fig. 1.

Fig. 6 is a section on the line 6—6 of Fig. 1.

Fig. 7 is a section on the line 7—7 of Fig. 1.

Fig. 8 is a detail showing a modified form of mechanism for co-ordinating the movements of the car gate and shaft door.

Fig. 9 is a detail showing a modified form of control locking mechanism.

Fig. 10 is a diagrammatic view of the car gate and shaft door movement co-ordinating mechanism.

Fig. 11 is a detail of auxiliary locking and lock release mechanism for the shaft door, and

Fig. 12 is a section on the line 12—12 of Fig. 1.

In said views let 1 indicate the shaft for an elevator, 2 a shaft door, 3 a car in the shaft, 4 a car gate, and 5 a control lever whereby the power to operate the car may be applied.

The shaft door, as usual, is hung by wheels 6 upon a rail 7, and the car gate, of the usual type, is movable from its forward vertical bar 8 to its fixed vertical bar 9. Said gate-bar 8 extends downwardly to a point below the car floor 10, and there engages a boss 11 that is slidably carried by a horizontal bar 12. The bar 12 is squared in cross-section at its intermediate portion, but is circular in cross-section at its ends for revoluble support in the respective bearings 13, 14. The boss 11 has a squared orifice 15 to receive the squared portion of the shaft, but the circular cross-section of the shaft at its forward end is extended back a sufficient extent to lie within the boss when the car gate is in its closed position. The reason for this arrangement will now appear.

The rear end of shaft 12 is engaged by a crank 15' that is actuated by a rod 16 which vertically intersects the axis of the control lever shaft, the rod 16 being vertically reciprocable in the operation of said control lever by suitable means co-acting between said rod and control lever. The shaft 12 and boss 11 are so related that the squared portion of the shaft is aligned with orifice 15 when the control lever is in its neutral position, with the power "off" (see Fig. 1), but when the control lever is moved, in either direction, from that neutral position,—the gate being closed—then the forward end of the squared portion of the shaft will abut against the rear surface of boss 11, and thus lock the gate from any opening movement. Hence, the gate cannot be opened while the power is "on" and the car in motion. Conversely, when, with the power "off"—the control being at neutral—and the gate partially or fully opened, then, as will be ap-

parent, the control becomes locked in its neutral position, by reason of the boss with its squared orifice having moved on to the squared portion of shaft 12 with which it is thereby aligned.

In Fig. 1 the connective or co-acting means between the rod 16 and control lever are represented in the form of a fitting 17 secured to the rod, a cross bar 18 secured to the control lever, and flexible connectors 19 or their equivalent extended between the respective ends of the cross-bar and the fitting.

The engagement between the gate bar 8 and boss 11 is here shown (see Fig. 12) as effected by the provision of a vertical recess 20 in the forward surface of the boss for the reception of bar 8, a recess covering plate 21 being affixed to the boss. The bar 8 is thus capable of independent vertical movement while itself holding the boss against rotation.

The shaft doors are normally held in their closed positions by individual locking mechanisms, having release means, which will now be described by aid of the example thereof illustrated in Fig. 2.

In this view (see also Fig. 1) appears a plate 22 secured in a suitable position in the elevator shaft, said plate having a horizontally arranged rack 23 attached thereto for engagement by a horizontally disposed pawl 24 pivotally carried by a vertical bar 25 that is attached to the shaft door. The plate 22 may have a cover 26 applied in spaced relation thereto, for which purpose an intervening wall extends about the upper portion of said plate leaving a clearance at the lower portion for the operation of pawl 24, but otherwise providing an enclosure for the exclusion of dust, etc.

When the pawl 24 is engaged with rack 23, as shown in full lines in Fig. 2, the shaft door, being closed, is thereby locked against opening movement, and, obviously, said shaft door cannot be opened until the pawl has been disengaged from the rack. To effect such disengagement I provide a vertically slidable bar 27, operable in guides 28 secured to the shaft door, said bar 27 having a slot 28' which engages a pin 29 extended from pawl 24, so that when bar 27 is moved upwardly it will lift the pawl 24 to release the latter from the rack, and then the shaft door is free to be opened.

A bell crank having the arms 30, 31 is pivoted at 32 to plate 22 above the pawl 24, the free end of arm 30 lying upon the upper surface of pawl 24, and the arm 31, which extends upwardly, carrying a stud 33 that projects outwardly through a slot 34 in cover plate 26. Also pivoted, at 35, to the plate 22 is a gravity pawl 36, whose free forward end bears against the end of pawl 24, in the normal, locked position of the latter, said pawl 36 having a tooth 37 adapted to

engage under the end of arm 30, to support it when the pawl 24 has been raised in the unlocking operation and moved in the opening operation of the shaft door. The dotted lines in Fig. 2 show the raised position of pawl 24 and arm 30; also the engagement of arm 30 by tooth 37 as the pawl 36 swings inwardly by gravity when the pawl 24 has been withdrawn. The bell crank is intended to co-act with certain other mechanism for locking the control against operation when the shaft door is unlocked, and the car is at a shaft-landing. It is for this purpose that the stud 33 is carried by arm 31 and is moved by the bell crank to the dotted line position of Fig. 2 with the raising of pawl 24, because then a shoe 38, associated with the control, constitutes with stud 33 a lock for the control to prevent operation of the car.

The shoe 38 is shown in Fig. 1 as carried by a bar 39 that is slidable in guides 40 along the top of the car, in position to pass the stud 33 in the travel of the car, and to have opposed contact with said stud 33 when the car is at a shaft landing and the bell crank has been rocked in unlocking the shaft door.

The control actuated rod 16 is connected, through a bell crank 41 that is pivoted at 42 to the car, and a horizontally disposed rod 43, with the bar 39, so that the shoe 38, when in opposed contact with stud 33, the control being at neutral, will thereby lock said control against actuation until the shaft door has been closed.

As here shown the bar 39 has an end plate 44 which provides an anchorage for the rod 43, adjustment means being provided comprising a threaded end 45 for rod 43, with nuts 46; also said end portion may be in jointed relation to rod 43, as at 47.

The shoe 38 is shown as provided with end inclines 48 for the purpose of guiding it past stud 33 in both directions of its movement.

From the foregoing description it will be apparent that when the car has arrived at a position where its floor is aligned with a shaft floor, and the pawl 24 has been raised to its lock released position by upward movement of bar 27, rocking the bell-crank to bring arm 31 to its dotted line position of Fig. 2, thereby shoe 38 has abutting contact with stud 33, thus preventing movement of rod 43 and consequently of rod 16, so that the control lever is held back by these means in its neutral position, with the power "off". In this position of the car both the car gate and shaft door can be operated, and a feature of my present invention consists in the provision of means for co-ordinating the opening and closing movements so that the gate and door may be both opened and closed through a single operation.

Therefore I provide a bell-crank which is pivoted at 49 to the shaft door and has arms

50, 51, the arm 50 lying within guide pins 52, extended from the shaft door, and having a projection or head 53, and the arm 51 having a slot 54 that engages a pin 55 carried by the bar 27. Mounted upon the car gate is a plate 56 that carries a pair of shoes 57, 58, in spaced opposed relation and positioned normally to pass the head 53, at respective sides thereof in the travel of the car, and so that when the car reaches a landing the head 53 will lie between the shoes 57, 58. In this last named position the movement of the car gate in opening is communicating through shoe 57 and head 53 to the shaft door, to also open the latter, and the closing movement of the car gate is communicated through shoe 58 and head 53 to the shaft door, to also close the latter.

Preliminary to the opening movement of the car gate the bell-crank is rocked due to the slight play allowed arm 50 between pins 52, in which rocking movement the arm 51 serves to raise bar 27 to perform the lock releasing operation necessary to free the shaft door for its opening movement.

The plate 56 is shown as secured at one end to a forward bar 59 of the car gate, and as being slidable within a strap 60 carried by a rearward bar 61 of said gate.

The car gate may have a handle 62 for its manipulation.

In some buildings the car gate and shaft doors are too heavy to be conveniently operated in unison by direct action such as is available through the use of a handle like that indicated at 62. Therefore, in such contingencies I provide means for multiplying the leverage with which the opening and closing operations are performed. Thus, for example, I pivot a manually operable lever 63, at 64, to a bracket 65 that is secured to the car floor; said lever having a spur 66, from which a pivotal link 67 depends, said link 67 being pivotally connected by a horizontal link 68 with a lever 69, that, at its free end, is provided with a slot 70, whereby it engages a pin 71 carried by the plate 56. Now, it will be apparent that when lever 63 is grasped by its handle 72, and pulled toward the left (see Fig. 1), the effect, through linkage 67, 68, will be to draw the upper portion of lever 69, and plate 56, in the same direction, the lower portion of lever 69 which is fast to pivot 69^a, mounted in bracket 73 that is secured to the under surface of the car, thereby enabling the applied leverage to be exerted horizontally upon plate 56.

It will be understood that the car floor is suitably apertured to receive the link 67.

Movement of the lever 63 to the right (Fig. 1) serves to close the car gate and shaft door.

The head 53, carried by arm 50 of the bell-crank, and adapted to engage the shoes 57, 58 for the joint operation of the car gate

and a shaft door, is shown in Figs. 4, 5 and 8 in the form of a wheel, carried by a shaft 74, which is reciprocably slidable in a bracket 75, against the tension of a spring 76, lying between said wheel and bracket, a stop 77 on the shaft 74 co-acting with the bracket to limit the outward movement of the wheel. The purpose in thus yieldingly mounting the head or wheel 53 upon arm 50 is to avoid the liability of breakage through faulty alignment. It is understood that the car in its travel causes the interspace separating shoes 57, 58 to receive head 53, and with proper alignment said shoes will freely pass the head without striking it. But if for example the head is not aligned with the interspace that separates the shoes, then it is liable to be struck by one of said shoes, and while said shoes have bevelled ends, as seen, to give them a tendency to glide over an obstruction, I have found it desirable to provide a spring support for the head so that it may yield when struck by a shoe, thereby enabling the shoe to depress said head when passing thereover.

The clearance between some shaft doors and the car gate is sufficient to permit the head 53 to be extended out by its spring support in the manner shown in Figs. 4 and 5. But there are other instances where the clearance is insufficient. Therefore in Fig. 8 I have shown a modification wherein a wheel or head 78 lies closer to the shaft door in its bearing 79 (no unlocking means such as the bell-crank with arms 50, 51 being employed), and the shoes 80, 81 which are carried by dogs 82, 83 pivotally mounted upon the car gate, are yieldingly held extended by springs 84, 85 that lie between said gate and dogs.

It is of course desirable, in the interest of safety, that the car floor should be exactly or very nearly aligned with a shaft landing before the shaft door can be opened, and while in the joint operation of the shaft door with the car gate the shoes 57, 58 may be very short in length to thereby establish the position of the car, within a given range of its movement relatively to the landing whereat the shaft door can be unlocked and opened together with the opening of the car gate, I may also, without limiting the length of shoes 57, 58, provide auxiliary locking means for the shaft door, releasable only when the car floor is aligned with the landing.

These auxiliary locking and release means are shown in Fig. 11 and comprise a bell-crank, pivoted at 86 within a casing 87 secured to the shaft door, near its bottom, said bell-crank having the horizontal arm 88 and vertical arm 89, the latter having a projecting stud 90. The arm 88 pivotally carries a pendent detent 91 that extends through a slot 92 in casing 87, and normally

engages a stop 93 secured to the wall of the shaft, to thereby lock the shaft door in its closed position. In order to release this lock the bell-crank is to be rocked about its pivot. For this purpose I provide a cam 94 which is mounted on the car floor and adapted to strike the stud 90 when the car floor arrives at about the level of the landing, travelling in either direction, the cam co-acting with the stud to rock the bell-crank and thereby release the lock. But when the cam leaves the stud 90, the bell-crank by gravity resumes its position in which the detent again may function as a lock.

In Fig. 9 I have shown a modified means for actuating the control locking mechanism. In this view the shaft which connects with the crank 15' is indicated at 95 and carries a wheel 96 that lies in an arcuate recess 97 formed in a disk 98 carried by the control lever. In consequence the shaft 95 is raised by movement of the control lever in either direction, by the wheel 96 riding up the arcuate recess until it reaches the periphery of disk 98, and when there the rod 95 is held fixedly at the limit of its movement. With this form of my control lock the shoe 99 would be liable to break in striking against stud 33, and therefore I place a yielding connection, in the form of a spring 100 between the rod 101 and plate 102, to thereby absorb such shocks as may be communicated to shoe 99.

For emergency use it may be necessary to operate the car with both the car gate and shaft doors open, and in such instances provision is made for rendering the control lock ineffective. Thus the rod 16 (or 95) may be composed of sections 103, 104 (Fig. 7) in opposed, spaced relation, and secured within a sleeve 105. One section may be secured to the sleeve by a removable pin 106 that, when removed, permits the operation of the control without actuation of the shoe 38 (or 99). That portion of sleeve 105 containing pin 106 can be encased within a box 107 having a glass front 108 that can be broken to give access to the pin.

In Fig. 10 I have only diagrammatically illustrated a fundamental principle underlying a salient feature of my invention, wherein a shaft door carries locking means *a* co-acting with a detent *b* fixed to the shaft, and the car gate has opposed shoes *c c* that engage a projection from a bell-crank *d* co-acting with the locking means *a* to release the lock and to cause the gate and door to operate in unison.

Emergencies may arise when, a car becoming stalled at some point in the shaft other than at a landing, it may become desirable for a shaft door to be opened from the outside. For this purpose I provide an orifice 109 through the shaft door (shown by a

dotted circle in Fig. 1) for the introduction of a pointed implement, which can then be entered within a hole or recess 110 in the bar 27 to lift said bar and thereby release the shaft door lock.

Variations within the spirit and scope of my invention are equally comprehended by the foregoing disclosure.

I claim:

1. The combination with an elevator shaft, a door therefor, a car operable within said shaft, and a gate for said car, of a lock comprising a fixed element secured to said shaft and a movable element carried by said door, adapted to engage said fixed element when the door is closed, thereby locking the shaft door, and means, slidably mounted on said door, and operable from within the car, to release said movable element from said fixed element, thereby unlocking the shaft door.

2. The combination with an elevator shaft, a door therefor, a car operable in said shaft, and a gate for said car, of a lock comprising a fixed element secured to said shaft and a movable element carried by said door adapted to engage said fixed element when the door is closed, thereby locking the door, means slidably mounted on said door to release said movable element from said fixed element, thereby unlocking the shaft door, pivotal means mounted on said door to actuate said release means, and means carried by said gate and operable therewith in its opening movement to control said release actuating means.

3. The combination with an elevator shaft, a door therefor, a car operable in said shaft and a gate for said car, of a lock comprising a fixed element secured to said shaft and a movable element carried by said door adapted to engage said fixed element when the door is closed, thereby locking the door, means slidably mounted on said door to release said movable element from said fixed element, thereby unlocking the shaft door, pivotal means mounted on said door to actuate said release means, stops to limit the movement in opposite directions of said pivotal means, and means carried by said gate and operable therewith in its opening movement (first, to control said release actuating means, (second) to co-ordinate the opening movement of the gate and door and (third) to co-ordinate the closing movements of the car and door.

4. The combination with an elevator shaft having a landing, a door for said landing, locking means for said door, a car operable in said shaft and a gate for said car, of release means for said locking means, release actuating means, and means on said gate, operable when the car is near the landing, to directly control said release actuating means.

5. The combination with an elevator shaft having a landing, a door for said landing,

locking means for said door, a car operable in said shaft, and a gate for said car, of release means for said locking means, pivotal means on said door provided with movement limiting means, said pivotal means in its movement serving to actuate said release means, and means on said gate, operable when the car is near a landing to control said pivotal means, first with respect to its actuation of the release means and second, by aid of said movement limiting means, for communicating the operation of the car gate to the shaft door.

6. The combination with an elevator shaft having a landing, a door for said landing, locking means for said door, a car operable in said shaft, and a gate for said car, of slidable release means for said locking means, a bell-crank pivoted to said door, one arm of said bell-crank engaging said release means and its other arm having a projecting head, stop means to limit the movement of said bell-crank, and opposed shoes in spaced relation positioned upon said gate to receive between them said projecting head when the car arrives near a landing whereby the opening movement of the gate is communicated through the bell-crank, first to the release means for the locking means and second for like operation of the landing door.

7. The combination with an elevator shaft having a landing, a door for said landing, a car operable in said shaft and a gate for said car, of a projection upon said door, and a pair of fixed spaced shoes upon said gate adapted to pass said projection at opposite sides thereof in the operation of the car, said shoes having bevelled ends and being so positioned that they will co-act with said projection when the car is near the landing to communicate the opening and closing movement of the gate to the door.

8. The combination with an elevator shaft having a landing, a door for said landing, a car operable in said shaft and a gate for said car, of a projection upon said door, and a pair of fixed spaced shoes upon said gate adapted to pass said projection at opposite sides thereof in the operation of the car, said shoes having beveled ends and being so positioned that they will co-act with said projection when the car is near the landing to communicate the opening and closing movement of the gate to the door, and spring means providing horizontal yielding motion between said projection and shoes, to prevent breakage when through faulty alignment a shoe strikes the projection.

9. In an elevator system, having a shaft and a car operable in said shaft, the combination of a fixed lock element upon said shaft, a movable lock element carried by said door, release means for said movable lock element mounted on said door, power

control means mounted in said car, pivotal means carrying a stud and movable with the release of said movable lock element, to locate said stud in a predetermined position, a shoe slidably mounted on the car and adapted to abut against said stud when the car arrives at a landing, and connecting means between the power control means and shoe to prevent the operation of the control while said shoe and stud are in abutting relation.

10. The combination with an elevator shaft having a landing, a car in said shaft, a power control lever mounted in said car, a vertical rod extended through said car in intersection with the axis of the control-lever-fulcrum, a cross-bar upon said control lever, connecting means between the arms of said cross-bar and said rod, whereby the movement of the control lever from neutral in either direction raises said rod, a horizontal rod slidably mounted upon the car, a shoe carried by said horizontal rod, a bell-crank connecting said vertical and horizontal rods, a landing door, locking means therefor, and means influenced by said locking means, when released, with the car at the landing, to then lie in the path of said shoe and thereby prevent the operation of the control lever.

11. The combination with an elevator shaft having a landing, a car in said shaft, a power control lever mounted in said car, a vertical rod extended through said car in intersection with the axis of the control-lever-fulcrum, means upon said control-lever co-acting with said rod to raise it a predetermined height with the movement of the control lever from neutral in either direction, a horizontal rod slidably mounted upon the car, a shoe carried by said horizontal rod, a bell-crank connecting said vertical and horizontal rods, a landing door, locking means therefor, and means influenced by said locking means, when released, with the car at the landing, to then lie in the path of said shoe and thereby prevent the operation of the control lever.

12. The combination with an elevator car having a gate, and a control mounted within said car, of a vertical rod operatively connected to said control, a horizontal member extended beneath the car and having a squared portion, bearings for said horizontal member, a boss having a squared orifice to receive the squared portion of the horizontal member, means extended from the gate to prevent rotation of said boss, and crank connecting means between said vertical rod and horizontal member, to rotate the latter whereby the squared orifice in the boss aligns with the squared portion of the horizontal member when the control is at neutral, to then permit the gate to be opened, and whereby the end of said squared por-

tion abuts against the boss to lock the gate closed when the control is in operation.

13. The combination with an elevator shaft having closure means and a car in said shaft also having closure means, of interengaging means between the respective closure means, whereby the operation of one is communicated to the other, means including a lever having a fixed fulcrum at one end and being in pivotal engagement with one of said closure means at its other end, a manually operable lever, also having a fixed fulcrum, and linkage between said levers for increasing the power applied for the operation of said closure means.

14. The combination with an elevator shaft having a landing, a door therefor, a car in said shaft and a gate for said car, of projecting means on said door, means upon said gate adapted to engage said projecting means, when the car is near the landing so that the door and gate may operate in unison, means including a lever having a fixed fulcrum at one end and being in pivotal engagement with one of said closure means at its other end, a manually operable lever also having a fixed fulcrum, and linkage between said levers for increasing the power applied for the operation of said closure means.

15. The combination with an elevator shaft having a landing, a door therefor, and a car in said shaft, of a fixed detent upon said shaft, a bell-crank pivoted to said door, a pivotal latch, pendent from said bell-crank, normally in engagement with said detent, to lock the door in its closed position, a shoe carried by the car, and means operable from within the car which cause said shoe to rock the bell-crank and thereby release the latch from the detent when the car arrives at the landing.

16. The combination with an elevator shaft having a landing, a door therefor, a car in said shaft and a control for said car, of locking means for said door, stop means

movable to a set position by said locking means, when released, and means connected with said control means to engage said stop means when in its set position and thus hold the control at neutral.

17. The combination with an elevator shaft having a landing, a door therefor, a car in said shaft and a control for said car, of locking means for said door, stop means movable to a set position by said locking means, when released, and means connected with said control means to engage said stop means when in its set position and thus hold the control at neutral, said control connected means including separated rod sections, a sleeve connecting said sections and means for readily disconnecting the sleeve from one of said sections to permit the free operation of the control.

18. The combination with an elevator shaft, a door therefor, and a car in said shaft, of locking means for said door, and lock release means including a vertically slidable bar operable from within the car, said door being provided with an orifice affording access to said bar for its emergency actuation.

19. The combination with an elevator shaft, a landing therefor, a door for said landing, and a car in said shaft, of locking elements carried respectively by said shaft and door, and lock release means carried by said door, said release means being operable from within the car.

20. The combination with an elevator shaft, a landing therefor, a door for said landing, and a car in said shaft, of locking means for said door, lock release means carried by said door, said lock release means being operable from within the car, and control means for said release means, said control means also serving as the means whereby said door is operable.

Executed this 10th day of July, 1925.

JACOB M. WHALBE.