Dec. 12, 1933. T. BRADY 1,939,200

DOORCLOSER AND ELECTRIC INTERLOCK

Filed March 21, 1931 3 Sheets-Sheet 1

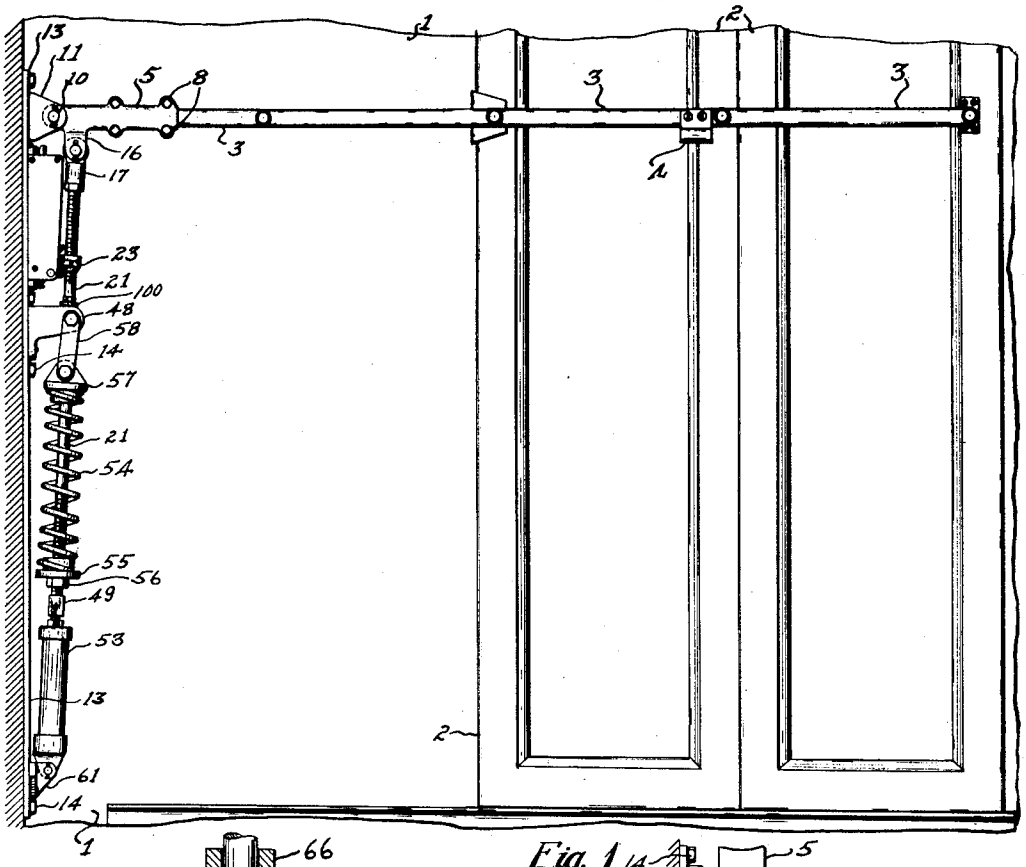


Fig. 1

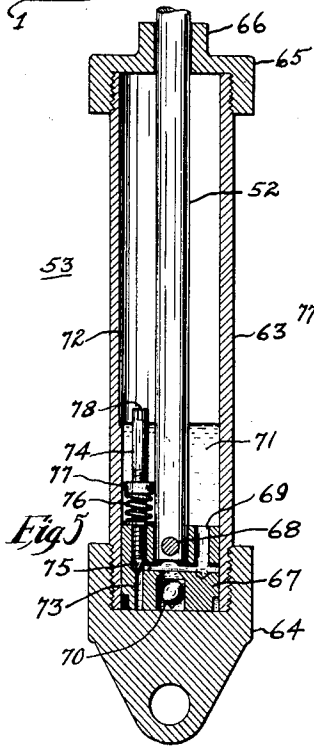


Fig. 5

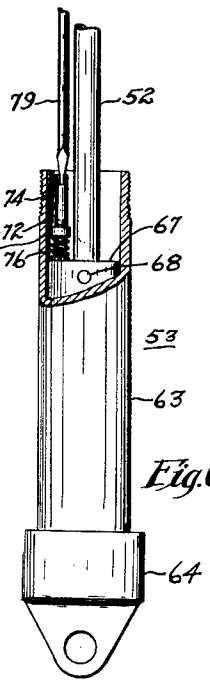


Fig. 6

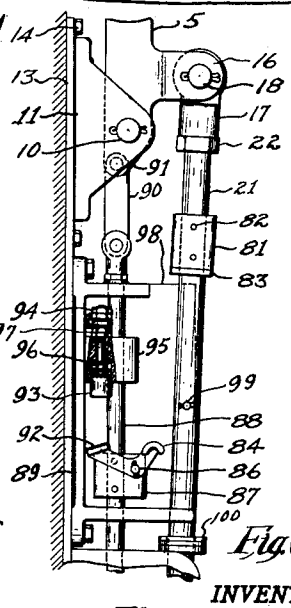


Fig. 9

INVENTOR
Thomas Brady,
BY George D. Richards
ATTORNEY

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Fig. 2

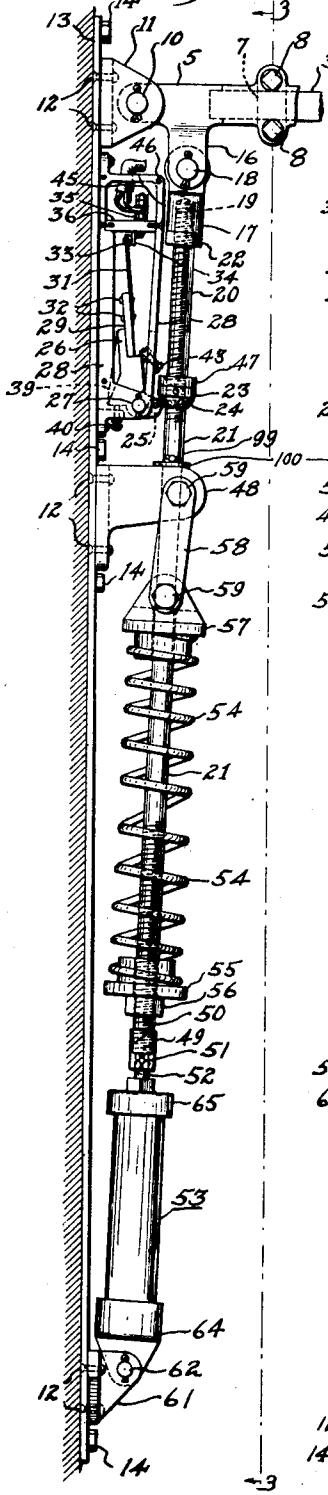
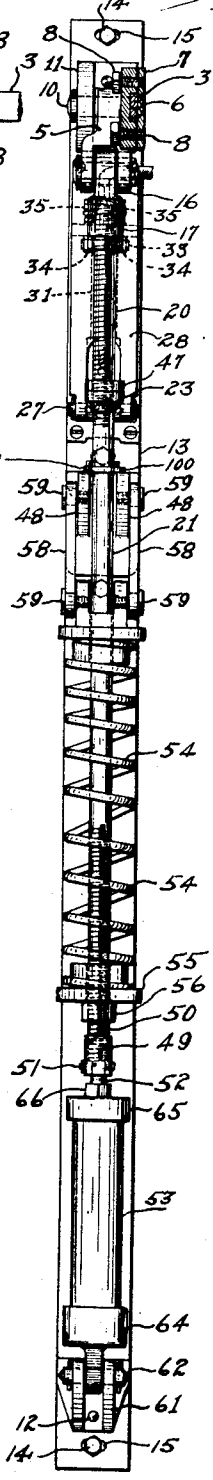


Fig. 3



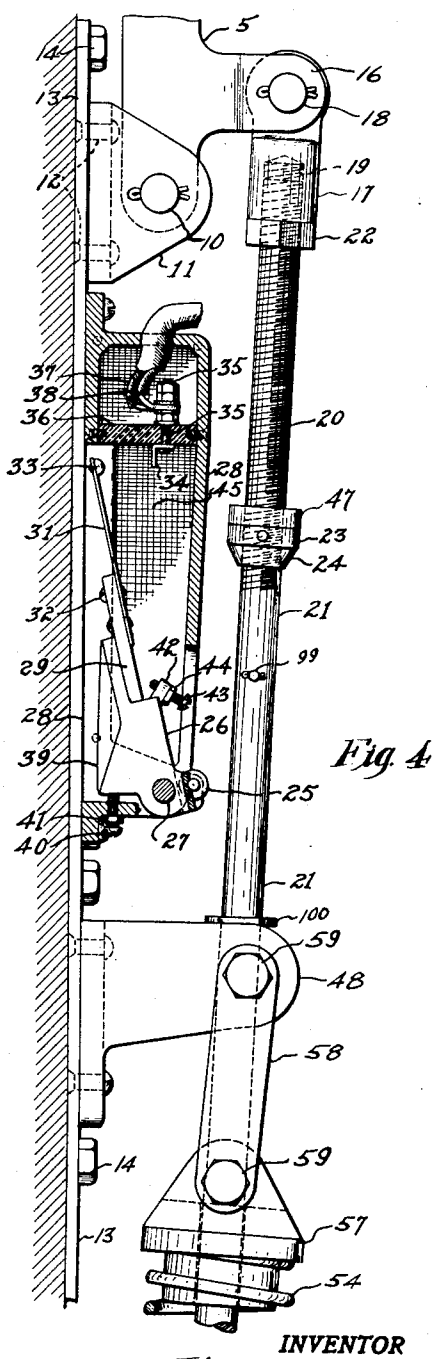


Fig. 4

INVENTOR
Thomas Brady,
BY George A. Richards
ATTORNEY

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Fig. 7

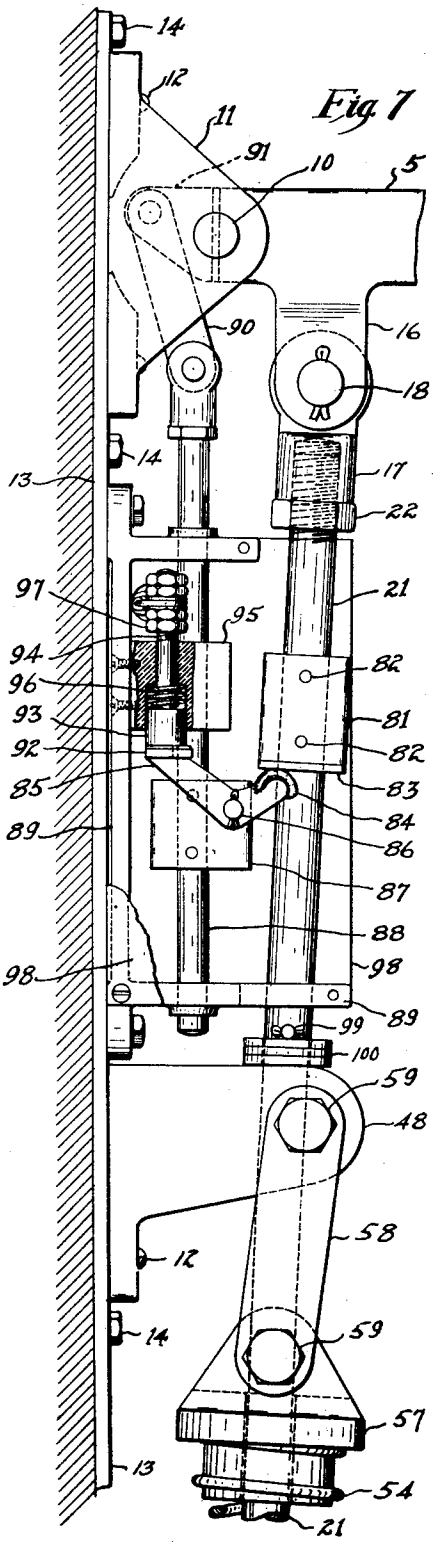
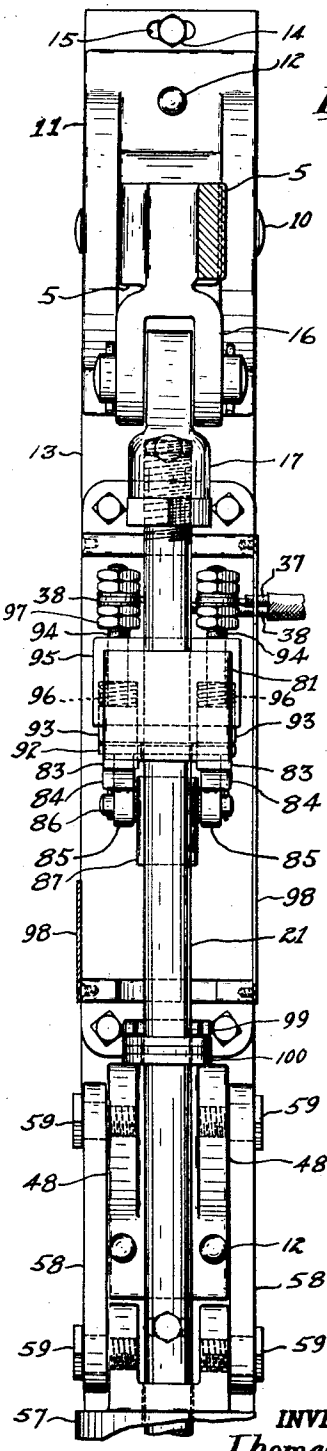


Fig. 8



INVENTOR
Thomas Brady,
BY George D. Richards
ATTORNEY

Patented Dec. 12, 1933 1,939,200

UNITED STATES PATENT OFFICE

1,939,200

DOORCLOSER AND ELECTRIC INTERLOCK

Thomas Brady, Orange, N. J.

Application March 21, 1931. Serial No. 524,262

16 Claims. (Cl. 187—31)

This invention relates, generally, to door closers; and the invention has reference, more particularly, to a novel door closer having an electric interlock switch incorporated therein, the said door closer being especially suitable for use on elevator hatchway doors.

Combined door closers and electric interlocks for elevator hatchway doors as heretofore commonly constructed, are somewhat unsatisfactory in use for several reasons. These interlocks are usually quite complicated in structure consisting of many movable parts, several of which are included in the connection between the door closing apparatus and the interlock switch. The use of such a plurality of movable parts between the door closing apparatus and the interlock switch results in considerable lost motion, especially at the bearing points of these parts, so that it is commonly necessary to allow for a relatively large movement of the hatchway door to effect the operation of the interlock switch. Thus, it takes usually the first two and a half to six inches of the opening movement of the door from its closed position to effect the opening of the interlock switch, and conversely when the door is closed the interlock switch will be closed when the door is still two and a half to six inches from its closed position. This necessitates the use of rack and pawl devices on the door and door sill to prevent the unwarranted opening of the door once the same has reached six inches of its closed position. Racks and pawls, however, are noisy and are not true safety devices and are therefore highly objectionable. These door closers and interlock switches are also generally constructed and arranged so that it is difficult to obtain access to the same for making repairs, and when repairs are being made, the door ofttimes is left unlocked, thereby increasing the personal injury hazard.

The principal object of the present invention is to provide a novel door closer and electric interlock, which, when installed in connection with an elevator hatchway door, acts to open the elevator control circuit as soon as the hatchway door commences to open and which does not again close the elevator control circuit until the door is again substantially completely closed and locked, thereby eliminating the use of racks and pawls heretofore commonly used.

Another object of the present invention lies in the provision of a novel door closer and electric interlock which is readily applicable to all types of hatchway doors whether two speed or single doors, the same having parts readily adjustable to suit the requirements of any particular installation and providing means whereby the force exerted by the door closer upon the door when closing the same may be readily and easily varied at will as desired, the said door closer being easily operated to effect the opening of the door and being quiet and positive in its action when closing the door, the same having liquid check means incorporated therein for cushioning the closing action of the door to prevent the slamming thereof.

Still another object of the present invention is to provide a novel door closer and electric interlock which is so constructed and arranged as to have a door closing and locking spring which is mounted independently of the liquid check means, so that when the latter is removed, as for the purpose of making adjustments or repairs or for cleaning the same, the former will still be operative to hold the door closed and in locked position.

A fourth object of the present invention lies in the provision of a novel door closer and electric interlock which is of simple, rugged construction, having relatively few movable parts and comprising an interlock switch which is directly operated by the door closing means and without the use of additional intermediatory parts which would tend to increase the lost motion between the interlock switch and the door closing means, said apparatus being reliable in use and having an exceedingly long life.

Another object of the present invention is to provide a novel door closer and electric interlock having liquid check means which is absolutely leak-proof and which is readily adjustable to suit the requirements of any particular installation.

Other objects of this invention not at this time more particularly enumerated, will be clearly understood from the following detailed description of the same.

The invention is clearly illustrated in the accompanying drawings, in which:—

Fig. 1 is a schematic view in elevation of a portion of an elevator hatchway and illustrates a two speed hatchway door equipped with the novel door closer and electric interlock of this invention, the door being illustrated in closed and locked position.

Fig. 2 is an enlarged view with parts broken away of the novel door closer and electric interlock illustrated in Fig. 1.

Fig. 3 is a sectional view taken along line 3—3 of Fig. 2.

Fig. 4 is an enlarged view with parts broken

away of a portion of the structure shown in Fig. 2, the device being shown in the position it assumes when the hatchway door is opened.

Fig. 5 is an enlarged vertical sectional view of the liquid check.

Fig. 6 is a somewhat smaller view of the liquid check with parts broken away or omitted and illustrates the manner of adjusting the checking action of the same.

Fig. 7 is an enlarged fragmentary view of a slightly modified form of construction, the parts being illustrated in door closed position.

Fig. 8 is a view looking at the right side of the structure shown in Fig. 7; and

Fig. 9 is a somewhat smaller view similar to Fig. 7 which illustrates the positions of the parts of the device of Figs. 7 and 8 when the hatchway door is open.

Similar characters of reference are employed in all of the above described views, to indicate corresponding parts.

Referring now to Figs. 1 to 6 of the drawings, the reference numeral 1 designates an elevator hatchway having a door 2, illustrated as of the two speed type. In Fig. 1 of the drawings the door is shown in closed position with the door operating linkage 3 in its horizontal, straight line formation, whereby the same locks the door in closed position. Linkage 3 is provided with an operating handle 4 and is connected to a door closer bracket lever 5. Since the door operating linkage 3 is old and well known in the art and forms no part of the present invention, the same would appear to require no further description. The door closer bracket lever 5 is recessed at 6 (see Fig. 3) to receive the end portion of linkage 3. To suit the requirements of any particular installation, this end portion of linkage 3 is longitudinally adjustable within the recess 6. The end portion of linkage 3 is connected in desired adjusted position to the bracket lever 5 by means of strap clamps 7 and screws 8, which screws extend through apertures in the bracket lever 5 and are threaded into apertures provided in the strap clamps 7. By tightening screws 8, the strap clamps 7 are caused to grip the end portions of linkage 3, thereby securing this linkage end portion to the bracket lever.

The bracket lever 5 is pivotally connected as by a pin 10 to an upper bracket 11. Bracket 11 is secured as by rivets 12 to a back plate 13 which in turn is attached to the hatchway wall or other supporting structure, as by means of screws 14 which extend through transverse slots 15 provided in the back plate 13. The transverse slots 15 allow transverse adjustment of the back plate 13 with respect to the hatchway wall which is desirable when installing the device. Bracket lever 5 has a depending bifurcated arm 16 to which is pivotally connected a yoke 17 as by means of a pin 18. Yoke 17 is formed with an interior threaded socket 19 extending upwardly from the bottom thereof for receiving the upper threaded portion 20 of a spring actuated rod 21.

When the door closer and electric interlock is installed, the yoke 17 is threaded the proper distance onto the threaded portion 20 so as to cause the linkage 3 to be truly horizontal when the door 2 is closed, thereby locking the door in its closed position. A lock nut 22 is provided for locking the yoke 17 in desired adjusted position upon the end portion 20 of the rod 21. A cam nut 23 is adjustably threaded upon the portion 20 of rod 21 below yoke 17. Cam nut 23 has a lower conical beveled portion 24 for engaging an interlock switch operating roller 25.

Operating roller 25 is carried by a switch lever 26 which is pivoted as upon a pin 27 which has its end portions extending through and supported in apertures provided in an interlock switch frame 28. Switch lever 26 carries an insulating block 29 made of any suitable insulating material such as a condensation product or a synthetic resin. A somewhat flexible finger 31, which may be made of resilient material, has its lower portion secured to the insulating block 29 as by divets 32. The upper portion of the finger 31 carries a transverse contact bar 33 of electric conducting material. Contact bar 33 cooperates with a pair of spaced stationary contacts 34 which are secured as by binding posts 35 to a transverse insulating panel 36. Insulating panel 36 is attached as by screws to the front and rear wall of the interlock switch frame 28. Electric leads 37 and 38 are connected, respectively, to the binding posts 35 and extend outwardly of the interlock switch frame 28 through an aperture provided in the top of this frame. Leads 37 and 38 are connected in the elevator control circuit so that when contact bar 33 bridges contacts 34, the elevator car may be operated, but when the contact bar 33 does not bridge contacts 34, the elevator car cannot be operated.

Switch lever 26 is formed with an overhanging portion 39 which, owing to the weight thereof, tends to turn lever 26 counter-clockwise about its pivotal pin 27, as viewed in Figs. 2 and 4, so that contact bar 33 is thus urged away from stationary contacts 34. A screw 40 is threaded upwardly through the bottom of switch frame 28 and is adapted to engage overhanging portion 39 to thereby limit the extent of movement of contact bar 33 away from stationary contacts 34. The screw 40 is adapted to be locked in adjusted position as by a nut 41 engaging the bottom of frame 28. Switch lever 26 is formed with an upwardly and outwardly inclined lug 42 into which a screw 43 is adjustably threaded. A lock nut 44 is adapted to lock the screw 43 in adjusted position. The sides of the interlock switch frame 28 are open and are adapted to be closed by side plates 45 which are secured to the sides of the frame 28 as by screws 46 that are threaded into apertures provided in this frame.

The cam nut 23 is so positioned on the rod 21 that the bevel portion 24 thereof will engage interlock switch operating roller 25 to hold the switch bar 33 in engagement with stationary contacts 34 when the elevator door is in closed and locked position, as illustrated in Fig. 2. The cam nut 23 is illustrated as locked in desired adjusted position on the threaded portion 20 of rod 21 by means of a lock nut 47. When the elevator door is opened, the bracket lever 5 swings upwardly into the position shown in Fig. 4 raising rod 21 so that cam nut 23 moves out of engagement with roller 25 and permits the overhanging portion 39 of lever 26 to move this lever counterclockwise so that contact bar 33 disengages contact 34, thereby opening the elevator motor control circuit and making it impossible to start or operate the elevator car.

The rod 21 extends downwardly from the cam nut 23 and between the legs of a bifurcated bracket 48 which, like bracket 11, is secured to the back plate 13 as by rivets 12. The lower end portion of rod 21 is threaded at 50 and is screwed into a disconnecting sleeve 49. Sleeve 49 is preferably square or of polygonal cross-section for

receiving a wrench to thread the same onto or off of the lower end of rod 21. A check rod 52 of a liquid check 53 has its upper end portion extending into disconnecting sleeve 49 and is pivotally connected to this sleeve as by a pin 51. A door closing coil compression spring 54 surrounds the lower portion of rod 21 and bears at its lower end against an annular spring seat or flange 55 which is slidable or adjustable along the rod 21. A nut 56 threaded upon the threaded portion 50 of rod 21 engages the bottom of spring seat 55, thereby transferring the downward pressure of spring 54 to rod 21. By adjusting nut 56 along the threaded portion 50, the spring seat 55 and hence the bottom portion of spring 54, may be adjusted up or down with respect to the rod 21, thereby increasing or decreasing the tension of this spring. The upper end of spring 54 engages an annular spring seat or flange 57 which is also slidably mounted on rod 21. Spring seat 57 is pivotally connected to the lower end portions of a pair of upwardly extending spaced links 58 by studs 59 which project through bearing apertures provided in the links 58 and have reduced threaded end portions 60 that are threaded into apertures provided in the spring seat 57. The upper end portions of links 58 are pivotally connected by studs 59 to the brackets 48

Liquid check 53 has its base 64 pivotally mounted on a bottom bracket 61 as by means of a pivotal pin 62. Bottom bracket 61, like brackets 11 and 48, is secured to the back plate 13 as by rivets 12. Liquid check 53, as especially shown in Figs. 5 and 6, comprises a hollow check cylinder 63 which is threaded at its lower end into a recess provided in the check base 64. A check cap 65 is threaded onto the upper end of check cylinder 63. Check cap 65 has a square projection 66 for receiving a wrench. A longitudinal groove 72 is provided in the inner side wall of check cylinder 63 and extends from the top of this cylinder downwardly to a point near the bottom thereof. The check rod 52 extends through a central aperture provided in the check cap 65 and at its lower end is connected to a check piston 67 as by a pin 68 which extends through aligned apertures provided in the check piston and in the check rod.

Check piston 67 is adapted to operate in a body of oil or other suitable liquid 71 contained in the lower end of the check cylinder. This check piston is provided with a passage 69 which communicates with a ball check valve 70. When the check piston 67 moves upwardly within check cylinder 63 as during the opening movement of the hatchway door, the check valve 70 is open, thereby permitting liquid 71 to flow from above piston 67, through passage 69 pass this check valve to the underside of the piston. The presence of longitudinal groove 72 also facilitates the passage of oil around the piston when the piston arrives opposite this groove.

Check piston 67 is provided with a by-pass 73 around ball check valve 70, whereby liquid may flow through this by-pass and into passage 69 without passing through the ball check valve. A check adjusting valve rod 74 is threaded into a vertical aperture provided in the check piston 67 and has a conical valve end portion 75 for controlling the useful area of by-pass 73, thereby regulating the rate at which liquid may flow through this by-pass. A coil compression locking spring 76 surrounds the threaded portion of valve rod 74 and bears at its lower end against a washer mounted on the top of piston 67 and at its upper end against a collar 77 threaded upon valve rod 74. Locking spring 76 by pressing upwardly against collar 77 binds this collar upon the valve rod and prevents the turning of this rod, so that this valve rod is thusly held in selected adjusted position. The upper end of valve rod 74 is provided with a screw driver slot 78 for receiving a screw driver used in adjusting the valve rod 74. When it is desired to adjust the valve rod 74 as when installing the door closer and interlock, the hatchway door is moved to open position, thereby raising the check piston 67 within the cylinder 63 into the position shown in Fig. 6. By unscrewing the cap 65 a screw driver 79 may be readily applied to the valve rod 74 to effect the adjustment of the same.

In use, if it be assumed that the hatchway door 2 is in closed position, as illustrated in Fig. 1, the door operating linkage 3 will be disposed horizontally so that door closer bracket lever 5 is also disposed horizontally and rod 21 is in its lowermost position, causing cam nut 23 to engage operating roller 25, to thereby hold contact bar 33 in bridging relation to contacts 34. At this time check piston 67 is at its lowermost position within check cylinder 63. Door closing coil compression spring 54 by pressing downwardly upon its lower seat 55 urges rod 21 downwardly, thereby acting to hold the several parts of the device in the positions illustrated in Fig. 1 with the door closed and locked. If now the car operator opens the hatchway door as by pulling downwardly upon handle 4, the door operating linkage 3 is broken or collapsed so that door closer bracket lever 5 is turned upwardly about its pivotal connection with bracket 11. This upward movement of lever 5 causes rod 21 to swing upwardly and outwardly somewhat against the tension of door closing coil compression spring 54.

As the hatchway door commences to open, the bevel portion 24 of cam nut 23 moves upwardly and away from interlock switch operating roller 25, thereby permitting switch lever 26 to turn clockwise, as viewed in the figures, under the weight of overhanging portion 39 and break the engagement of contact bar 33 with stationary contacts 34. It will be noted that the roller 25 is positioned relatively close to the switch lever pivotal pin 27, whereas the contact bar 33 is at a considerable distance from this pivotal pin so that just as soon as rod 21 starts to move upwardly as the door commences to open, the resultant relatively small movement of roller 25 will cause an immediate separation of contact bar 33 from contacts 34. In other words, the slightest motion of roller 25 upwardly as lever 26 turns counter-clockwise, causes contact bar 33 to have a relatively large motion away from contact 34 so that the elevator motor control circuit is broken quickly and positively at the instant the door starts to open.

If for any reason the switch lever 26 should stick and not turn counter-clockwise under the weight of the overhanging portion 29 as rod 21 starts to move upwardly during the door opening operation, the lock nut 47 will strike the adjustable screw 43 and thereby force the switch lever to turn counter-clockwise so that contact bar 33 will disengage contacts 34. In all ordinary operations of the apparatus, the screw 43 is never engaged by the lock nut 47 because the overhanging portion 39 is amply sufficient to immediately break the engagement between the contacts 33 and contacts 34. Screw 43 is only provided as a precautionary measure and com-

plies with the requirements of the statutes of some of the States.

As the rod 21 moves upwardly and outwardly during the door opening operation, the upper spring seat 57 rocks somewhat about its pivotal connection with the links 58 which in turn rock slightly about their pivotal connections with the bracket 48, while the liquid check 53 also turns somewhat about its pivotal connection with the bracket 61. The check piston 67 does not resist the upward movement of the rod 21 because during such upward movement, liquid 71 can flow readily through passage 69, pass check valve 70 to the underside of the check piston. Also, additional liquid may flow around this piston through groove 72 when the check piston is traveling opposite this groove. As the door is thus opened, and rod 21 moves upwardly, the door closing coil spring 54 is compressed so that the tension thereof is increased preparatory to the closing operation of the door. Fig. 4 illustrates the positions of the interlock switch and adjacent parts when the door is fully opened. It will be noted that the cam nut 23 has moved a considerable distance away from operating roller 25.

When the car operator desires to close the hatchway door, he merely releases the handle 4 whereupon the hatchway door closing coil spring 54, by pressing downwardly upon its spring seat 55, forces rod 21 downwardly, thereby turning the door closing bracket lever 5 downwardly about its pivotal connection with bracket 11. During the greater portion of the door closing movement, the check piston 67 is opposite groove 72 and moves freely within check cylinder 63. As soon as the hatchway door approaches within a few inches of its closed position, the check piston 67 enters that portion of cylinder 63 which is not provided with the groove 72, so that during the latter portion of the travel of the check piston the same is forced downwardly into the liquid 71 causing this liquid to be forced through by-pass 73, pass conical valve 75 through passage 69 and above the piston. The check adjusting valve 75 resists the flow of liquid through by-pass 73, thereby slowing up the motion of the check piston and consequently slowing the closing action of the door and effecting the checking of the same to prevent the slamming thereof. Just as the door reaches its closed position, cam nut 23 engages interlock switch operating roller 25 to effect the immediate engagement of contact bar 33 with stationary contacts 34, thereby preparing the elevator motor control circuit for operation of the elevator motor.

In the form of the invention shown in Figs. 7, 8 and 9 a somewhat different construction of interlock switch is employed. The interlock switch illustrated in these figures is even more rapid in its operation than the switch illustrated in the preceding figures. In these figures, the rod 21 instead of carrying a cam nut 23 has an insulating block 81 secured thereto as by pins 82. Insulating block 81 carries two cam plates 83 on the underside thereof for engaging arms 84 of an interlock switch lever 85. Interlock switch lever 85 is mounted on a pin 86 which extends through an aperture provided in an insulating block 87. Insulating block 87 is fixed upon a vertically extending rod 88 which is slidably mounted in bearings provided in the interlock switch frame 89 and is pivotally connected to the lower end of a link 90 which has its upper end pivotally connected to a rearward extension 91 formed on the door closer bracket lever 5.

Switch lever 85 carries a contact bar 92 for engaging a pair of contacts 93 that are carried by the lower ends of binding posts 94. Binding posts 94 are vertically slidable somewhat in an insulating block 95 which is secured to the interlock switch frame 89. Contacts 93 project upwardly into pockets provided in insulating block 95 and compression springs 96 within these pockets urge the contacts 93 toward the contact bar 9. Nuts 97 limit the downward motion of posts 94 under the action of springs 96. Binding posts 94 are adapted to be connected to the elevator motor control leads 37 and 38 in the same manner that binding posts 35 are connected to these control leads. Side plates 98 are adapted to cover the sides of the interlock switch frame 89.

In use, if it be assumed that the elevator door is closed, the interlock switch parts are in the positions shown in Figs. 7 and 8. If the door is now opened by the car operator, the bracket lever 6 will be turned upwardly about its pivotal pin 10 as before. As this lever starts to turn upwardly as the door commences to open, the rod 21 will be moved upwardly permitting interlock switch lever 85 to turn counter-clockwise to thereby move contact bar 92 out of engagement with contacts 93. At the same time that this switch lever 85 is turning counter-clockwise, its pivotal pin 86 is being moved downwardly, thereby moving the switch lever 85 and contact bar 92 bodily away from contacts 93. This will be apparent when it is noted that as bracket lever 5 swings upwardly it causes link 90 and rod 88 to move downwardly, thereby moving insulating block 87 downwardly and consequently effecting an extremely rapid separation of contact bar 92 from contacts 93.

Fig. 9 illustrates the relative positions of the switch parts when the door is in fully open position. It will be noted that the switch lever 85 has moved a considerable distance from the contacts 93. When the door is again closed the switch lever 85 will be moved upwardly and just as the door reaches its completely closed position, the switch lever arms 84 will be engaged by the cam plates 83, to thereby effect the instantaneous bridging of contacts 93 by contact bar 92. The compression springs 96 cushion the bridging action of the contact bar 92 upon the contacts 93. The operation of the other parts of the apparatus shown in Figs. 7, 8 and 9 is exactly the same as that described for the preceding views.

It will be noted that the novel door closer and interlock switch of this invention is of rugged, simple construction and has many distinct advantages. The most noticeable of these advantages lies in the fact that as the door starts to open, the interlock switch opens immediately before the door has moved an appreciable distance. The interlock switch being open prevents further operation of the elevator car and this switch remains open until the door is again substantially completely closed and locked.

In practice, it is found that before the door has opened a crack the width of a person's finger, the interlock opens and conversely this switch again closes when the door is within a similar distance from closed position so that it is impossible for one to operate the elevator car as long as the hatchway door is the least bit open, thereby greatly enhancing the safety of operation of the elevator car. This desirable result is obtained because of the use of a minimum of

bearing points between the moving door and the interlock switch itself, and is also due to the relatively great motion of the interlock switch with respect to the motion of the moving rod 21. In other words, a relatively slight motion of the rod 21 and bracket 5 results in a large motion of the contact bar away from the stationary contacts of the interlock. When using the novel door closer and electric switch interlock of this invention, a rack and pawl is unnecessary inasmuch as the interlock switch is always open when the door is the least bit open.

The novel door closer and electric interlock of this invention has many advantages among which may be mentioned the relatively great ease with which the same may be mounted in a hatchway, the ability of the same to be readily adjusted so that the linkage 3 may be made horizontal, the ease with which the tension of door closing compression spring 54 may be adjusted and the simplicity of operation of the check 53. It will be noted that to vary the tension of the door closing coil compression spring, it is merely necessary to turn up or down on nut 56, whereas heretofore it has been necessary to thread the spring seat itself up or down on the rod which was a very difficult procedure.

Also, it will be noted that the novel liquid check of this invention employs no gaskets or packings whatever, and provides ready means whereby the checking action thereof may be varied, it being merely necessary to open the hatchway door, remove cap 65 and adjust valve rod 74 to adjust the checking action. The checks heretofore used are commonly provided with stuffing boxes which invariably leak, causing oil to drip down the hatchway, marring the appearance thereof and necessitating the refilling of the check with liquid at frequent intervals. Since there is no leakage from applicant's liquid check, it is very seldom necessary to put additional fluid therein. If it should be desired to remove the liquid check for any reason, as for purposes of repair, this may be done without leaving the door unlocked, it is merely necessary to disconnect pin 51 from the check rod 52 and to withdraw the check rod from the disconnecting sleeve 49. A pin 99 carried by rod 21 above bracket 48 is adapted to engage a washer 100 resting on this bracket when the door is closed and locked and the linkage 3 is in a horizontal position. Thus, when the pin 99 engages the washer 100, the rod 21 cannot move further downwardly and consequently supports the linkage 3 and prevents the collapse of this linkage after the removal of the check 53.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:—

1. A door closer and electric interlock comprising, lever mechanism arranged for connection to a door, a door closing spring, transmission means connecting said door closing spring to said lever mechanism for transmitting the force of said spring to said lever mechanism to effect the closing of the door, an electric interlock positioned adjacent said transmission means, and cam means carried by said transmission means for actuating said electric interlock to closed position upon the closing and locking of the door, said cam means disengaging said electric interlock to cause the movement of the same to open position upon the opening of the door.

2. A door closer and electric interlock comprising, a lever arranged for connection to the operating linkage of a door, a door closing spring, a rod connecting said spring to said lever to effect the closing of the door, cam means carried by said rod, an electric interlock having a switch lever mounted adjacent said rod, said switch lever being biased to circuit open position, said rod cam means engaging said switch lever upon the closing and locking of the door to effect the closing operation of said electric interlock, and disengaging said switch lever upon the initial opening of the door to cause the opening operation of said electric interlock, and means carried by said switch lever and engageable by said cam means to effect a positive opening operation of said electric interlock in the event said switch lever should fail to move to open position upon the disengagement of the same by said cam means.

3. A door closer and electric interlock comprising, a lever arranged for connection to a door operating linkage, a door closing spring, a rod connecting said spring to said lever to effect the closing and locking of the door, a disconnectible liquid check connected to said rod for checking the closing movement of the door, an electric interlock position adjacent said rod, means carried by said rod for actuating said electric interlock to closed position upon the closing and locking of the door, and means for supporting said rod upon the disconnection of said liquid check therefrom, whereby said door is held in closed and locked position.

4. A door closer and electric interlock comprising, a bracket lever arranged for adjustable connection to a door operating linkage, a spring actuated rod connected to said bracket lever, a spring seat adjustable along said rod, a door closing coil compression spring surrounding said rod and bearing against said spring seat, and means for adjusting said spring seat along said rod without turning said spring seat with respect to said rod.

5. A door closer and electric interlock comprising, a bracket lever arranged for adjustable connection to a door operating linkage, a door closing spring, a rod connecting said spring to said bracket lever for transmitting the force of said spring to said bracket lever, an interlock switch positioned adjacent said rod, and a cam nut adjustable along said rod for actuating said interlock switch.

6. A door closer and electric interlock comprising, a bracket adapted to be attached to a fixed support, a bracket lever fulcrumed on said bracket and arranged for connection to a door operating linkage, a rod depending from said bracket lever and movable therewith, a yoke adjustably and pivotally connecting the upper end of said rod to said bracket lever, a door closing coil compression spring surrounding said rod and connected thereto for urging the door toward closed position, cam means carried by said rod, and an interlock switch positioned adjacent said rod, said interlock switch having a switch lever arranged to be actuated to contact closed position by said cam means upon the door moving to closed and locked position.

7. A door closer and electric interlock comprising, a bracket adapted to be attached to a fixed support, a bracket lever fulcrumed on said bracket

and arranged for connection to a door operating linkage, a rod depending from said bracket lever and movable therewith, a yoke adjustably and pivotally connecting the upper end of said rod to said bracket lever, a door closing coil compression spring surrounding the lower portion of said rod and connected thereto for urging the door toward closed position, cam means carried by the upper portion of said rod, and an interlock switch positioned adjacent said rod, said interlock switch having a switch lever arranged to be actuated to contact closed position by said cam means upon the door moving to closed and locked position, said switch lever being so constructed and arranged as to move under the influance of gravity to contact open position when the door starts to open.

8. A door closer and electric interlock comprising, a bracket adapted to be attached to a fixed support, a bracket lever fulcrumed on said bracket and arranged for connection to a door operating linkage, a rod depending from said bracket lever and movable therewith, a door closing coil compression spring surrounding said rod, said compression spring having its upper end held against upward movement and having its lower end adjustably connected to said depending rod for urging the door toward closed position, a disconnectible coupling member attached to the lower end portion of said rod, a liquid check positioned below said rod for checking the closing movement of the door and having its check piston rod releasably connected by said coupling member to the lower end of said depending rod, whereby said liquid check may be bodily removed when desired.

9. A door closer and electric interlock comprising, a bracket adapted to be attached to a fixed support, a bracket lever fulcrumed on said bracket and arranged for connection to a door operating linkage, a rod depending from said bracket lever and movable therewith, an interlock switch, means for biasing said switch to open position, cam means carried by said rod for effecting the closure of said interlock switch, a door closing coil compression spring surrounding said rod and connected thereto for urging the door toward closed position, a liquid check positioned below said rod for checking the closing movement of the door and having its check piston rod releasably connected to the lower end of said depending rod, said liquid check having a check cylinder with uninterrupted side walls and bottom, whereby leakage of liquid from said check cylinder is prevented.

10. A door closer and electric interlock comprising, a bracket adapted to be attached to a fixed support, a bracket lever fulcrumed on said bracket and arranged for connection to a door operating linkage, a rod depending from said bracket lever and movable therewith, a readily accessible door closing coil compression spring surrounding said rod and connected thereto for urging the door toward closed position, a liquid check positioned below said rod for checking the closing movement of the door and having its check piston rod releasably connected to the lower end of said depending rod, whereby said liquid check may be removed bodily from said rod as for repairing the same, said liquid check having a check cylinder with uninterrupted side walls and bottom, whereby leakage of liquid from said check cylinder is prevented.

11. A door closer and electric interlock comprising, a back plate adapted for attachment to a fixed support, an upper bracket secured to said back plate, a bracket lever pivoted on said upper bracket and arranged for connection to a door operating linkage, a depending rod adjustably connected to said bracket lever, an interlock switch mounted on said back plate below said upper bracket, said interlock switch having a switch lever presented toward said depending rod, cam means carried by said rod for actuating said switch lever, a center bracket secured to said back plate below said interlock switch, a link pivotally connected to said center bracket and depending therefrom, a spring seat surrounding said depending rod and pivotally connected to said link, a second spring seat slidably mounted on said depending rod below said first spring seat, a door closing coil compression spring interposed between said spring seats in surrounding relation to said depending rod, means for adjusting said lower spring seat along said depending rod to vary the tension of said door closing spring, a disconnectible liquid check connected to the lower end of said depending rod, and a lower bracket secured to said back plate and pivotally supporting said liquid check.

12. A door closer and electric interlock comprising, a back plate adapted for attachment to a fixed support, an upper bracket secured to said back plate, a bracket lever pivoted on said upper bracket and arranged for connection to a door operating linkage, a yoke pivotally connected to said bracket lever, a depending rod adjustably connected to said yoke, an interlock switch mounted on said back plate below said upper bracket, said interlock switch having a switch lever provided with an operating roller presented toward said depending rod, cam means carried by said rod for actuating said switch lever operating roller, a center bracket secured to said back plate below said interlock switch, a link pivotally connected to said center bracket and depending therefrom, a spring seat surrounding said depending rod and pivotally connected to said link, a second spring seat slidably mounted on said depending rod below said first spring seat, a door closing coil compression spring interposed between said spring seats in surrounding relation to said depending rod, means for adjusting said lower spring seat along said depending rod to vary the tension of said door closing spring, a disconnectible liquid check connected to the lower end of said depending rod, a lower bracket secured to said back plate and pivotally supporting said liquid check, and stop means on said depending rod for engaging said center bracket to retain the door in locked position when said check is disconnected from said depending rod.

13. In a door closer and electric interlock, an interlock switch comprising, a switch frame, an insulating block mounted within said switch frame, a pair of spaced contacts carried by said insulating block, a switch lever having a contact bar for bridging said spaced contacts, and a rod having cam means thereon and movable upon the closing and locking of the door to cause said cam means to engage said switch lever and effect the engagement of said contact bar with said pair of contacts, said rod being movable upon the initial opening of the door to cause said cam means to disengage said switch lever, whereupon said lever moves said contact bar out of engagement with said pair of contacts.

14. In a door closer and electric interlock, an interlock switch comprising, a switch frame,

an insulating block mounted within said switch frame, a pair of spaced contacts carried by said insulating block, a switch lever having a contact bar for bridging said spaced contacts, and a rod having cam means thereon and movable upon the closing and locking of the door to cause said cam means to engage said switch lever and effect the engagement of said contact bar with said pair of contacts, said rod being movable upon the initial opening of the door to cause said cam means to disengage said switch lever, whereupon said lever moves said contact bar out of engagement with said pair of contacts, and means for moving said switch lever bodily proportionally to the movements of the door whereby an exceedingly rapid engagement and disengagement of said contact bar with said pair of contacts takes place.

15. A door closer and electric interlock comprising, a lever mechanism arranged for connection to a door, a door closing spring, transmission means connecting said door closing spring to said lever mechanism for transmitting the force of said spring to said lever mechanism, an electric interlock positioned adjacent said transmission means, said electric interlock having a switch contact carrying member provided with a weighted portion for normally urging said switch contact carrying member to open position, and an actuating member carried by said transmission means for directly operating said electric interlock switch contact carrying member to closed position upon the closing and locking of the door.

16. A door closer and electric interlock comprising, a lever arranged for connection to the operating linkage of a door, a door closing spring, a rod connecting said spring to said lever to effect the closing of the door, cam actuating means carried by said rod, and an electric interlock having a switch lever mounted adjacent said rod, said switch lever having an overhanging portion for normally urging said switch lever toward open position, said rod cam actuating means engaging said switch lever upon the closing and locking of the door to effect the closing operation of said electric interlock.

THOMAS BRADY.