J. E. W. FOGAL AND C. L. FULGHUM.

DEVICE FOR OPERATING FREIGHT ELEVATOR HATCH DOORS.

APPLICATION FILED FEB. 20, 1920.

1,378,017. **Patented May 17, 1921.**

5 SHEETS—SHEET 1.

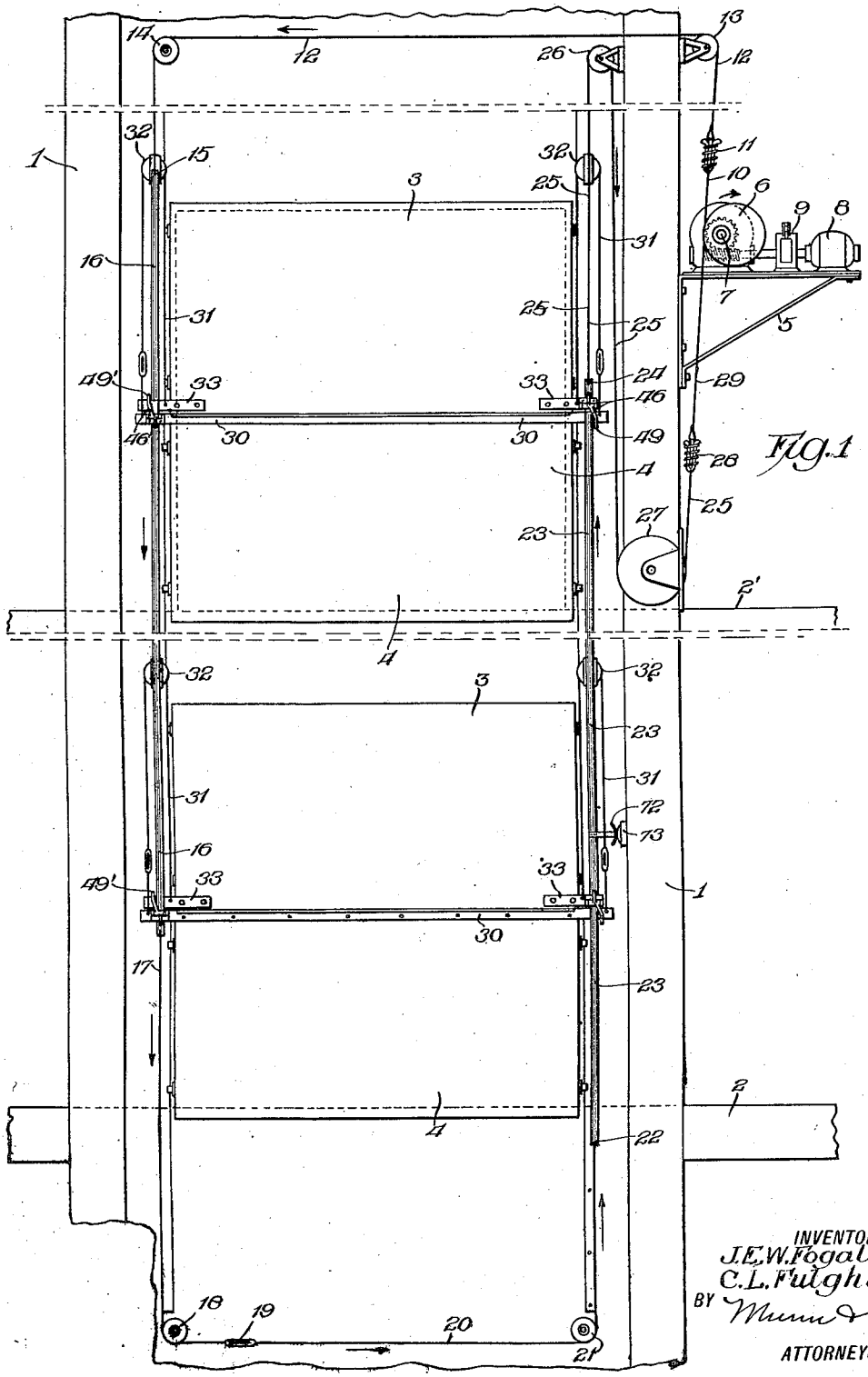


Fig. 1

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Fig. 3

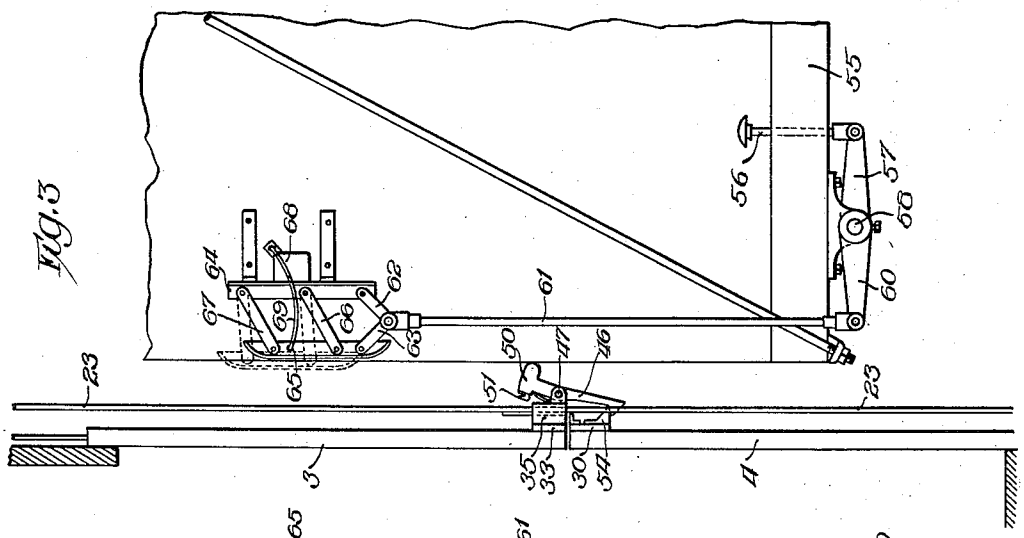
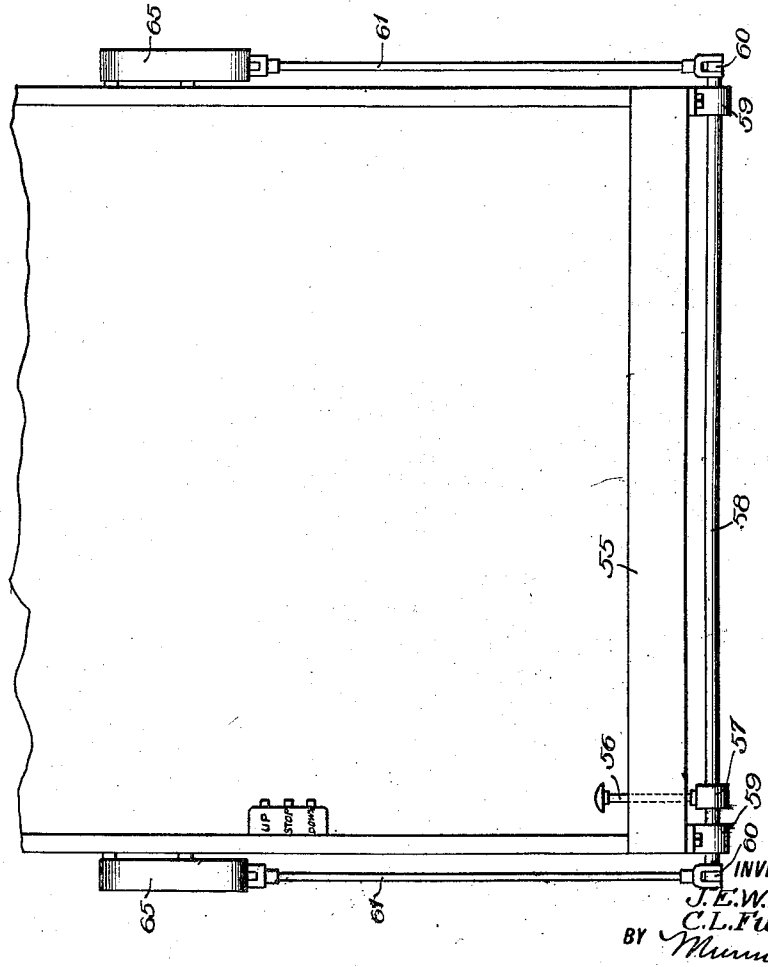


Fig. 2



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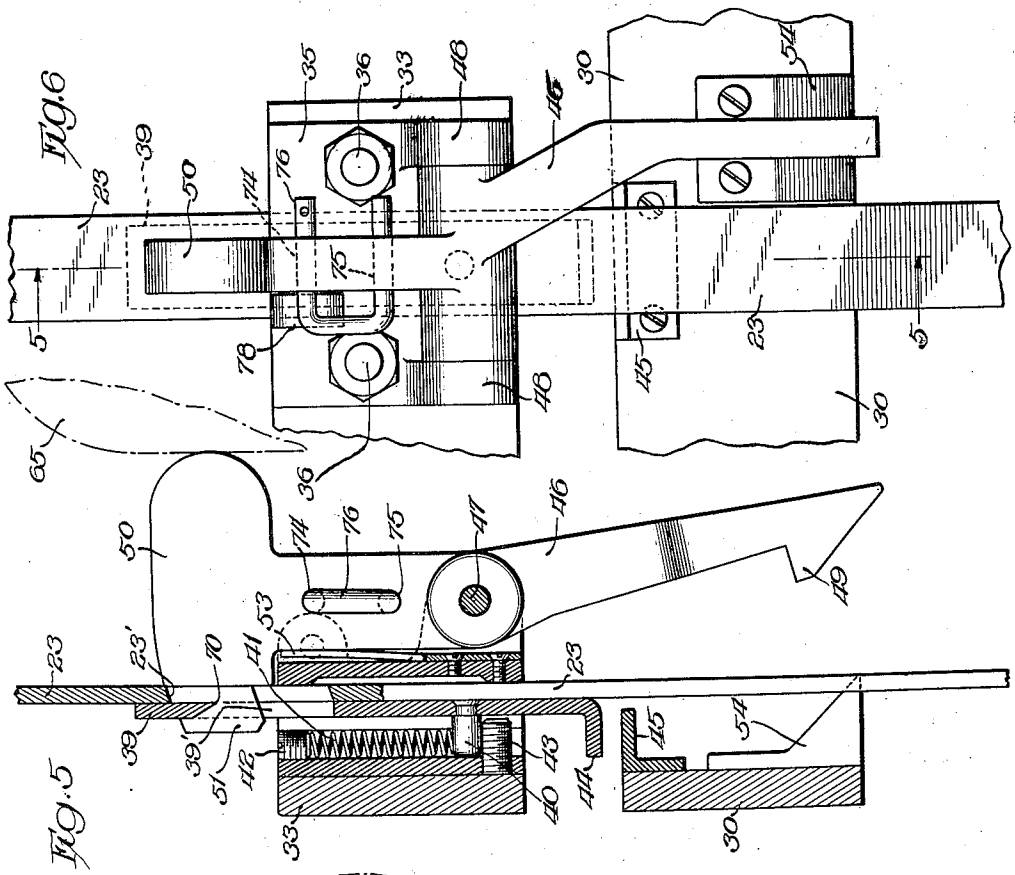


FIG. 6

FIG. 5

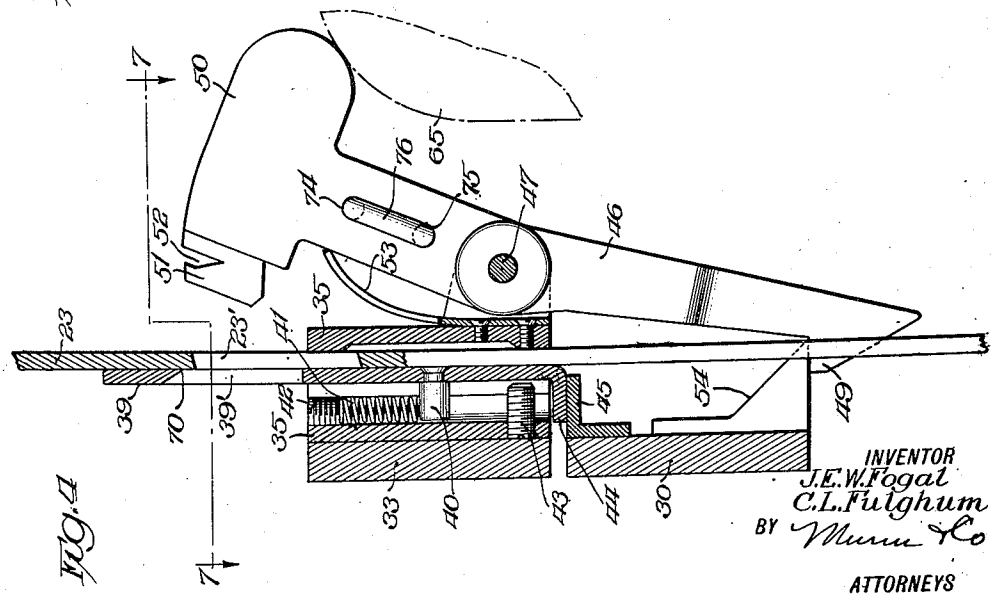


FIG. 4

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5 SHEETS—SHEET 4.

Fig. 9

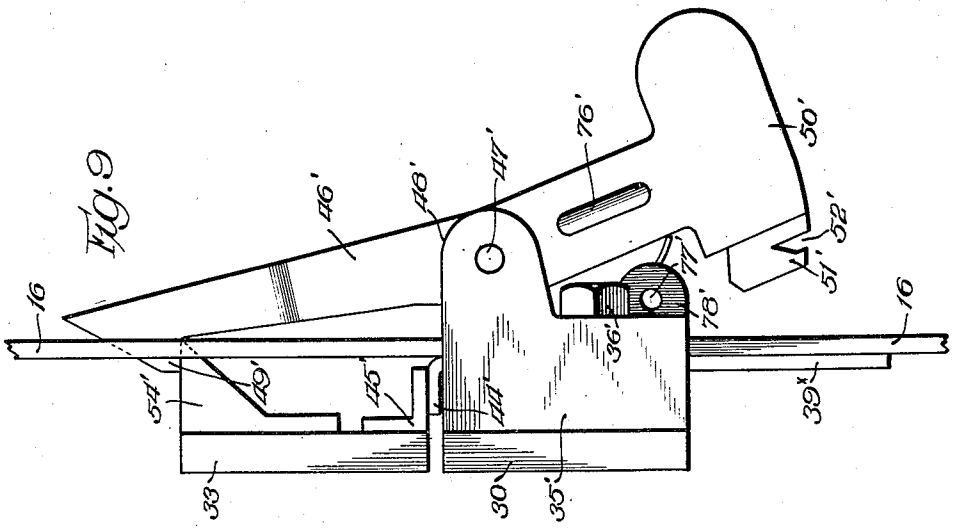


Fig. 8

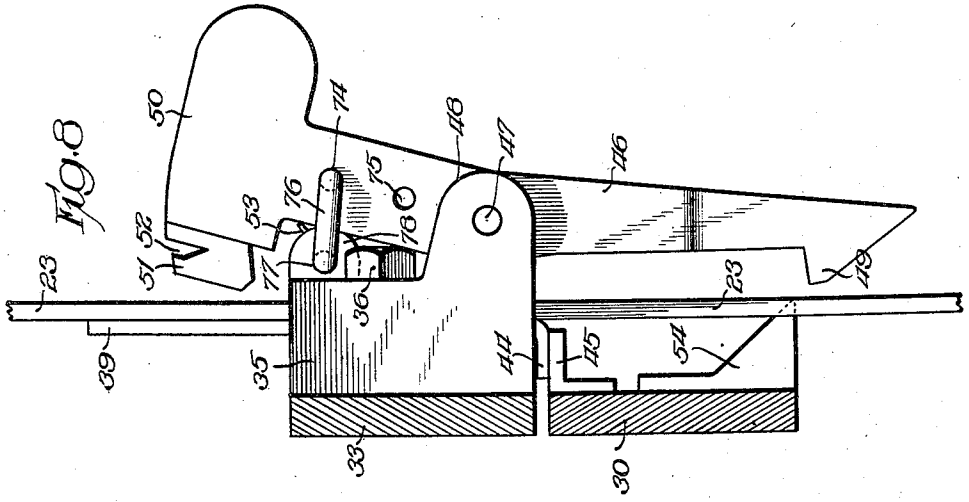
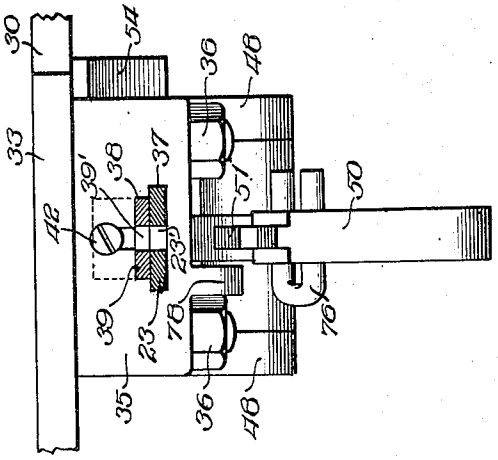


Fig. 7



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5 SHEETS—SHEET 5.

Fig. 10

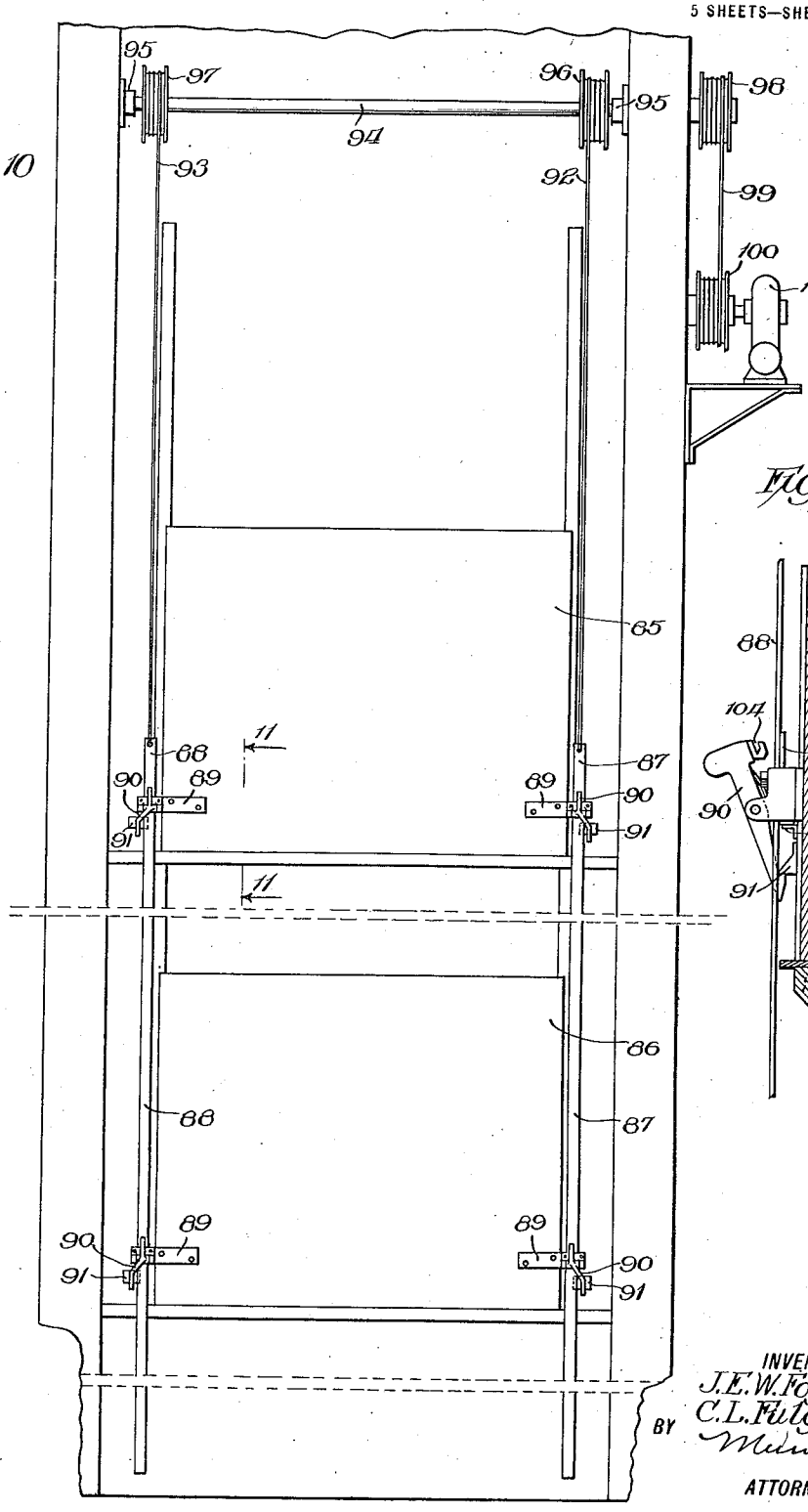
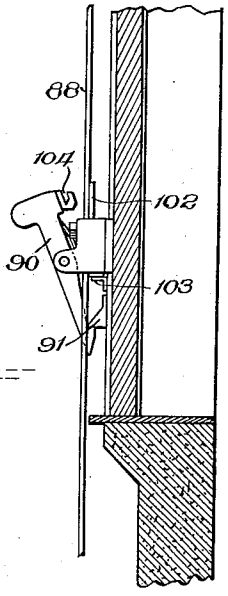


Fig. 11



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UNITED STATES PATENT OFFICE.

JOHN E. W. FOGAL AND CLAUD L. FULGHUM, OF QUINCY, ILLINOIS.

DEVICE FOR OPERATING FREIGHT-ELEVATOR HATCH-DOORS.

1,378,017. Specification of Letters Patent. Patented May 17, 1921.

Application filed February 20, 1920. Serial No. 360,206.

To all whom it may concern:

Be it known that we, JOHN E. W. FOGAL and CLAUD L. FULGHUM, both citizens of the United States, and residents of Quincy, in the county of Adams and State of Illinois, have invented a new and useful Improvement in Devices for Operating Freight-Elevator Hatch-Doors, of which the following is a full, clear, and exact description.

Our invention relates to improvements in devices for operating freight elevator hatch doors, and it consists in the combinations, constructions and arrangements herein described and claimed.

An object of our invention is to provide a device by means of which elevator hatch doors may be operated from the car of the elevator so as to start with a relatively slow motion, attaining a maximum rate of movement, and then to be slowed up or decelerated toward the end of the movement.

A further object of our invention is to provide a device by means of which a pair of hatch doors, which are normally locked together, may be unlocked, one door moving upwardly and the other downwardly simultaneously, both doors starting with a slow movement, gradually being accelerated, and slowing up toward the end of the movement.

A further object of our invention is to provide a device of the type described in which the doors may be operated in pairs, as stated above, the initial movement and the final movement being relatively slow both in the closing or the opening of the doors.

A further object of our invention is to provide a novel form of operating means for manipulating the doors, consisting of a drum mounted eccentrically with cables connected to the drum and forming, with a lift bar, a complete loop or circuit, means being provided for securing the doors to the lift bars, whereby the doors are operated simultaneously.

A further object of our invention is to provide a device of the type described in which the unlocking of the doors is positively accomplished by the same means which secures the doors to the lift bars.

A further object of our invention is to provide means for simultaneously unlocking the doors, connecting them with the lift bar, and closing the actuating circuit of the motor which operates the doors.

Other objects and advantages will appear in the following specification, and the novel features of the invention will be particularly pointed out in the appended claims.

Our invention is illustrated in the accompanying drawings, forming part of this application, in which—

Figure 1 is a view of a hatch showing the doors in their normally closed position, and means for operating them,

Fig. 2 is a front view of a portion of an elevator car showing a foot push rod and devices operated thereby,

Fig. 3 is a side view of a portion of a car, showing its relation to the elevator doors,

Fig. 4 is a sectional view through a portion of an upper and a lower door, showing the means for locking the two together,

Fig. 5 is a view similar to Fig. 4 showing the locking means in position for unlocking the doors and for connecting the upper door to the lift bar,

Fig. 6 is a face view of the mechanism shown in Fig. 5,

Fig. 7 is a sectional view along the line 7—7 of Fig. 4,

Fig. 8 is a detail view of a modified form of the locking mechanism showing the same held in inoperative position,

Fig. 9 is a detail view of the locking mechanism on the opposite side of the door from that shown in Fig. 4,

Fig. 10 is a view of a modified form of the door operating device, and

Fig. 11 is an enlarged section along the line 11—11 of Fig. 10.

Referring now to Fig. 1, the elevator hatch is indicated at 1 and the different floors at 2 and 2′. At each floor are doors such as those shown at 3 and 4. It will be noted that these doors 3 and 4 are arranged in pairs, the doors 3 being designed to be lifted and the doors 4 to be lowered simultaneously, as will be explained later. At 5 we have shown a bracket or support for a drum 6 which is mounted eccentrically on a shaft 7, driven by any suitable means, as by a motor 8. At 9 we have indicated diagrammatically a brake coil.

Wound around a portion of the drum 6 is a cable 10 which is connected by a compression spring 11 with a cable 12, passing over a pulley 13, thence laterally over a pulley 14, thence downwardly, being connected

at 15 with a lift bar 16 which extends below the upper end of the lowermost door 4. A cable 17 is connected to the lift bar 16 at its lower end, passes around a pulley 18, being connected by means of a turn-buckle 19 with a cable 20 which passes around a pulley 21 and is connected at 22 to the lower end of a lift bar 23. The upper end of the lift bar is connected at 24 with a cable 25 which passes over a pulley 26, thence downwardly around a pulley 27, and upwardly, being attached to a compression spring 28. A cable 29 is secured to the compression spring 28 and is wound around a portion of the drum 6. It will thus be seen that there is a loop around the hatch consisting of the cables and lift bars, as described.

Each of the lower doors 4 is provided with a cross bar 30, at the ends of which are attached cables 31 which pass over fixed pulleys 32 and are secured to arms 33 projecting laterally from the upper doors near the bottoms thereof. This arrangement is for the purpose of providing for the simultaneous movements of the doors, since it is obvious that as the upper door rises, the lower door will drop at the same rate.

Consider now the action of the eccentrically mounted drum. If, in the position shown in Fig. 1, the drum is rotated in a clockwise direction, as shown by the arrow, it will draw on the cable 29 and let out on the cable 10. This will pull on the cable 25 which is attached to the lift bar 23, thus tending to lift the bar. The lift bar 16 is connected at its lower end to the lift bar 23 and will be drawn downwardly, the cable 12 being paid out to compensate for the downward movement of the lift bar 16. When the drum is rotated in the opposite direction, the lift bar 23 will move downwardly, and the lift bar 16 will move upwardly.

The means for normally holding the doors 3 and 4 together and for unlocking them is best shown in Figs. 4, 5 and 6. In Fig. 4 it will be observed that the arm 33, which is secured to the top door 3 (see Fig. 1), has secured to it a housing 35 by means of bolts 36 (see Fig. 6). The housing 35 is slotted as shown at 37 in Fig. 7 to permit the lift bar 23 to slide freely therein. The housing is also provided with a slot 38 to permit a bar 39 to slide therein, this bar being provided with a pin or lug 40 (see Figs. 4 and 5) which is normally pressed on by a spring 41, which bears at one end on a screw plug 42, which may be removed to insert the spring. The housing is provided with a screw 43 which acts as a stop member to limit the movement of the bar 39. The latter is bent laterally at its lower end, as shown at 44, and is arranged to rest normally on an angle iron bearing plate 45, secured to the bar 30 which is fastened, as stated, to the lower door. The lift bar 23 is provided with an opening 23′, and the bar 39 is provided with an opening 39′, these openings being normally arranged to register to permit the entrance of one end of the locking pawl, as hereinafter described. The locking pawl 46 is pivotally mounted at 47 between ears 48 (see Fig. 6) projecting from the casting 35. The lower end of the pawl has a shoulder or hook 49, while the upper end is provided with a head 50 having an extension 51 provided with a slot 52. The pawl is normally pressed on by a leaf spring 53, as shown in Fig. 4, so as to throw the lower end, with its shoulder 49, underneath a bracket 54, secured to the bar 30, which is fastened to the lower door, thus locking the lower door and the upper door together. When the head of the pawl 50 is pressed inwardly, *i. e.*, toward the registering openings 39′ and 23′, the lower end 49′ swings outwardly, disengaging the doors, as shown in Fig. 5.

The means for causing the disengagement of the pawl 46 is best shown in Figs. 2 and 3. In these figures, the elevator car 55 is shown as being provided with a foot push rod 56 which is mounted on a lever 57 (see Fig. 3.) A rock shaft 58 is connected with the lever and is journaled in bearings 59 at the ends of the car. Arms 60 extend from the ends of the rock shaft, and to these arms are pivoted rods 61 which are connected with links 62 and 63 at their upper ends. A link 62 is connected with a stationary angle bar 64, the link 63 being connected to a shoe 65. Pivoted links 66 and 67 connect the shoe with the angle bar 64 so as to maintain the parallelism of the two members 64 and 65 at all times. At 68 we have shown diagrammatically a switch which is operated by a chain 69 connected to the shoe 65.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. The elevator car 55 may be raised or lowered in any suitable manner, as, for instance, by an electric motor (not shown). When the car arrives opposite a landing, the operator steps on the foot push 56, thereby rotating the rock shaft and forcing the rods 61 upwardly (see Figs. 2 and 3). This will cause the shoes 65 on opposite sides of the car to be forced forwardly, *i. e.*, toward the hatch doors. One of these shoes will come in contact with the head 50, thereby swinging it from the locking position shown in Fig. 4 to that shown in Fig. 5, thus unlocking the lower door 4 from the upper door 3. The extension 51 on the head 50 will enter the registering openings 39′ and 23′, so that when the doors are opened, the slidable bar 39 will rest in the slot 52, as shown in Fig. 5. The outer movement of the shoe 65, due to the

pressing of the foot push, will cause the operation of the switch 68 to close the circuit of the motor 8.

At this point it is well to observe that on the opposite side of the elevator is a pawl 46′ (see Fig. 1) whose upper end 49′ corresponds to the lower end 49 of the pawl 46. The pawl 46′ (see Fig. 1) is pivotally mounted on the rod 30 and is hooked over the arm 33, while, as before stated, the pawl 46 is pivotally mounted on the arm 33 and is hooked under the portion 54, carried by the rod 30. One of the shoes 65 will unlock the pawl 46′ simultaneously with the unlocking of the pawl 46 by the other shoe 65. The opposite end of the pawl 46′ will be thrown into position to engage the lift rod 16 in precisely the same manner that the pawl 46 was thrown into position to engage the lift bar 23 in Fig. 2.

Now when the motor 8 is started, the drum 6 begins to revolve in the direction shown by the arrow in Fig. 1, slowly winding up the cable 29 and letting out on the cable 10. The upper door 3 of either of the pairs of doors 3 and 4 (as shown in the drawing), opposite which the elevator has stopped, will be drawn upwardly, since the pawl 46, which is secured to the upper door, will be engaged by the movable lift rod 23 to pull it upwardly, but since the upper and lower doors are attached together by the cables 31, the lower door will descend as the upper door rises. The lift rod 23 will be raised, while the lift rod 16 will be lowered. Since, however, the lift rod 16 is now connected to the lower door by the pawl 46′, it will, by its action, aid in lifting the upper door by the cable connection 31, so that the movement of these doors will be absolutely uniform. At the first movement of the doors apart the spring 41 will force the bar 39 downwardly into the slot 52, so as to lock the pawl in position. As the drum continues to revolve, it will, owing to its eccentricity, cause the acceleration of the doors. After the drum has rotated 180° or half a turn, this movement will be decelerated, so that the doors start slowly, speed up during the first half of the movement, and gradually slow up to the end of the movement. This enables the doors to be operated much faster than it is possible to operate the doors by the use of ordinary drums. The motor is designed to be automatically stopped after one revolution of the drum by any suitable means, as, for instance, by a drum type switch in which is used a screw feed nut that meets a resistance after traveling a fixed distance, which is suitable for the opening of the door. This resistance may cause the revolving of the circular points to rotate and break the switch connection mechanically by opening the switch connection and stopping the motor. The motor being reversible, it is only necessary to press the proper button when the motor is energized to run it in the other direction, and it may be stopped by the drum action in the same manner as described.

When the motor is energized to run in the opposite direction, the cables are reversed in their movement, the lift bar 23 is lowered, and the lift bar 16 is raised. This will cause the lowering of the upper door 3 and the raising of the lower door 4. The operator, of course, has removed his foot from the foot push, and consequently at the time the doors are closing, the shoe 35 has returned to its full line position shown in Fig. 3, by gravity. Therefore, when the slidable door 39 (see Figs. 4 and 5) engages the angle iron 45, the bar will be pushed upwardly against the tension of the spring 41, thus bringing the edge 70 out of the slot 52, whereupon the spring 53 will force the head 50 upwardly and the hook 49 inwardly, so that when the doors reach the position shown in Fig. 4, the hook will engage underneath the member 54, thereby holding the doors together. Similarly on the opposite side of the elevator, the pawl 46′ will be brought to its locking position, so that the doors will be firmly locked together.

It will be observed that we have provided a cam member 72 (see Fig. 1) which is attached to one of the lift bars, as, for instance, the lift bar 23, and which, when the doors are closed, engages a switch 73, which switch may complete the circuit of the auxiliary starting coil of the elevator proper (not shown). When the cam 72 moves away from the switch 73, the contacts of the latter are opened, so that the elevator starting circuit is broken, thereby preventing the starting of the elevator until the doors have again been closed.

Referring again to Figs. 4, 5 and 6, it will be seen that we have provided the pawl 46 with a pair of openings 74 and 75 arranged to receive a staple 76. This staple is carried in this position for the sake of convenience. Now if for any reason the door operating device cannot be used, the pawls can be held in inactive position, and the doors operated manually until the equipment has been again put in order by removing the staple from its normally inactive position, and placing it in the opening 74 and also in the opening 77 in the ear 78 of the casting 35, as shown in Fig. 8. The hook 49, as well as the extension 51, are now held by the staple in inoperative position, so that it is only necessary to press the pawl at the opposite side of the door inwardly to release the doors and open them manually. The doors, being counterbalanced, are easily opened or closed by hand. When the doors are shut by hand, one pawl will operate to lock them in the manner described.

Each car is provided with a set of push buttons (see Fig. 2) marked "Up", "Stop", and "Down." The electrical circuit forms no part of the present invention. The closing of the switch 68 has the same effect as the pushing of the button marked "Up" to start the motor 8.

In Fig. 1, we have shown the cable portions 10 and 12, and 25 and 29 as being connected by torse springs 11 and 28 respectively, and the cable portions 20 and 17 as being connected by the turnbuckle 19. These are for the purpose of making proper adjustments and providing lost motion for the cable that varies on account of the eccentric shape of the drum.

In Figs. 10 and 11 we have shown a modified form of door operating device, in which single doors 85 and 86 are provided. On one side of these doors is a lift bar 87, and on the opposite side, a lift bar 88. Each door is provided with an outwardly extending arm 89 on each side thereof, to which is pivotally connected a pawl 90 similar to the pawl 46 and arranged to engage a lug or bracket 91 on the hatch wall. A cable 92 is attached to the lift bar 87, while a similar cable 93 is attached to the lift bar 88. A shaft 94 is journaled in bearings 95 and has a drum 96 arranged to receive the cable 92, and also a drum 97 arranged to receive the cable 93. The shaft 94 is extended at one end, and is provided with a drum 98 connected with a cable 99, with a drum 100 on the shaft of the motor 101. In this form of the device the pawl 90 at each side of any particular door is operated by the shoe 65 (see Fig. 3) in the manner already described, thus freeing the door from the locking lug 91 and connecting the pawl with the lifting bars 87 and 88, so that when the motor 101 is operated, both lift bars will be raised and will carry with them the particular door whose pawls have been thrown into operative relation with the lift bars.

On the reversal of the motor 101, the door will descend, and when the slidable bar 102 (see Fig. 11) engages the angle iron 103, the bar will be lifted out of the slot 104, thereby permitting the spring to throw the upper end of the pawl outwardly and the lower end in locking position with the locking lug 91, thus locking the doors in their normal position.

We claim:

1. A device for operating elevator hatch doors comprising a motor, a cable operated by said motor, a lift bar, a locking device carried by the door for normally locking the door in its closed position, and means for engaging the locking device to throw it out of locking position and into operative engagement with the lift bar, whereby the door is lifted with the latter.

2. A device for operating elevator hatch doors comprising a motor, cables actuated by said motor, a lift bar on each side of the door connected with certain of said cables, locking devices carried by the door in close proximity to said lift bars for locking the door in its normally closed position, and means for simultaneously moving said locking devices to unlock the door and to move the locking devices into operative engagement with the lift bars, whereby the door is moved with the lift bars.

3. A device for operating elevator hatch doors comprising a motor, cables actuated by said motor, a lift bar on each side of the door connected with certain of said cables, locking devices carried by the door in close proximity to said lift bars for locking the door in its normally closed position, means for simultaneously moving said locking devices to unlock the door and to bring the locking devices into operative engagement with the lift bars, whereby the door is moved with the lift bars, and means for automatically securing the locking devices to the lift bars subsequent to the initial movement of the door from its normally closed position.

4. A device for operating elevator hatch doors comprising a motor, cables actuated by said motor, a lift bar on each side of the door connected with certain of said cables, locking devices carried by the door in close proximity to said lift bars for locking the door in its normally closed position, means for simultaneously moving said locking devices to unlock the door and to bring the locking devices into operative engagement with the lift bars, whereby the door is moved with the lift bars, means for automatically securing the locking devices to the lift bars, and a spring actuated latch member held in inoperative position when the door is closed, and adapted to be brought into position to secure the locking devices to their respective lift bars after the door has moved from its normally closed position.

5. The combination with an elevator hatch door of a motor, cables actuated by the motor, a lift bar on each side of the door actuated by said cables, each of said lift bars having an opening, pivoted pawls carried by the door, means engaged by one of the pawls for holding the door in locked position, an elevator car, and means carried by said elevator car for engaging the opposite ends of the pawls to unlock the door and to force a portion of the pawls through the openings in said lift bars, whereby the latter are secured to the pawls.

6. The combination with an elevator hatch door of a motor, cables actuated by the motor, a lift bar on each side of the door actuated by said cables, each of said lift bars having an opening, pivoted pawls carried by the door, means engaged by one of the pawls for holding the door in locked

position, an elevator car, means carried by said elevator car for engaging the opposite ends of the pawls to unlock the door and to force a portion of the pawls through the openings in said lift bars, whereby the latter are secured to the pawls, and means for preventing the disengagement of the pawls from the lift bars while the door is in open position.

7. The combination with an elevator hatch of elevator hatch doors arranged in pairs at each landing, means for normally locking the doors of each pair together, an elevator car, a motor, cables actuated by the motor, a lift bar on each side of said doors, said lift bars being actuated by said cables, and means carried by the elevator car for simultaneously unlocking any pair of doors and for connecting each door with one of said lift bars.

8. The combination with an elevator hatch of elevator hatch doors arranged in pairs at each landing, means for normally locking the doors of each pair together, an elevator car, a motor, cables actuated by the motor, a lift bar on each side of said doors, said lift bars being actuated by said cables, means carried by the elevator car for simultaneously unlocking any pair of doors and for connecting each door with one of said lift bars, and cable connections between the doors of each pair for causing the doors to move in opposite directions at the same rate when either of said doors is moved by the lift bar.

9. A device for operating elevator hatch doors comprising a motor, a door, means cooperating with said motor for opening and closing said door, a locking device carried by the door for normally locking the door in its closed position, and means for engaging the locking device to throw it out of locking position and into operative engagement with said first named means.

10. The combination with a pair of vertically slidable doors, means for opening and closing said doors, means for normally locking the doors together, an elevator car, and means carried by the elevator car adapted to engage said locking means and to throw it out of locking position and into operative engagement with said first named means, said first named means being adapted to simultaneously move the doors in opposite directions at the same rate of speed.

11. The combination with a pair of vertically slidable doors, means for opening and closing said doors, means for normally locking the doors together, an elevator car, and means carried by the elevator car and adapted to engage said locking means to throw it out of locking position and into operative engagement with said first named means, whereby said doors are opened in opposite directions at a slow initial movement, accelerated toward the central portion of the movement, and retarded toward the end of the movement.

12. The combination with an elevator hatch of a plurality of pairs of doors, said doors being arranged to move vertically, a motor, an eccentric drum driven by the motor, a lifting bar disposed at each side of the sets of doors, cable connections from said drum to the top of one of said lifting bars, cable connections from said drum to the top of the other lifting bar, and cable connections between said bars, whereby the doors are moved simultaneously in opposite directions, and means for securing said doors to said lift bars at will to cause the doors to travel with the lift bars.

13. The combination with an elevator hatch of a plurality of pairs of doors, said doors being arranged to move vertically, a motor, an eccentric drum driven by the motor, a lifting bar disposed at each side of the sets of doors, cable connections from said drum to the top of one of said lifting bars, cable connections from said drum to the top of the other lifting bar, and cable connections between said bars, whereby the doors are moved simultaneously in opposite directions, and means for securing any door of each pair of doors to one of the lift bars and the other door of the pair to the other lift bar to cause the doors to travel with said lift bars.

14. In an elevator door operating device, a pair of vertically disposed lift bars, a motor, an eccentric drum driven by said motor, cables carried by said drum, idlers for supporting said cables, said cables being attached to the tops of said lift bars, a cable for connecting the bottoms of the lift bars together, idlers for supporting said last named cable, a plurality of vertically movable doors disposed between the lift bars, and means for connecting said doors to said lift bars at will to move with the lift bars.

15. In an elevator door operating device, a pair of vertically disposed lift bars, a motor, an eccentric drum driven by said motor, cables carried by said drum, idlers for supporting said cables, said cables being attached to the tops of said lift bars, a cable for connecting the bottoms of the lift bars together, idlers for supporting said last named cable, a plurality of doors disposed between said lift bars and movable vertically, said doors being arranged in pairs, the doors of each pair being movable simultaneously in opposite directions, and means for connecting one door of each pair to one lift bar, and the other door to the other lift bar.

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