May 8, 1928.

1,669,184

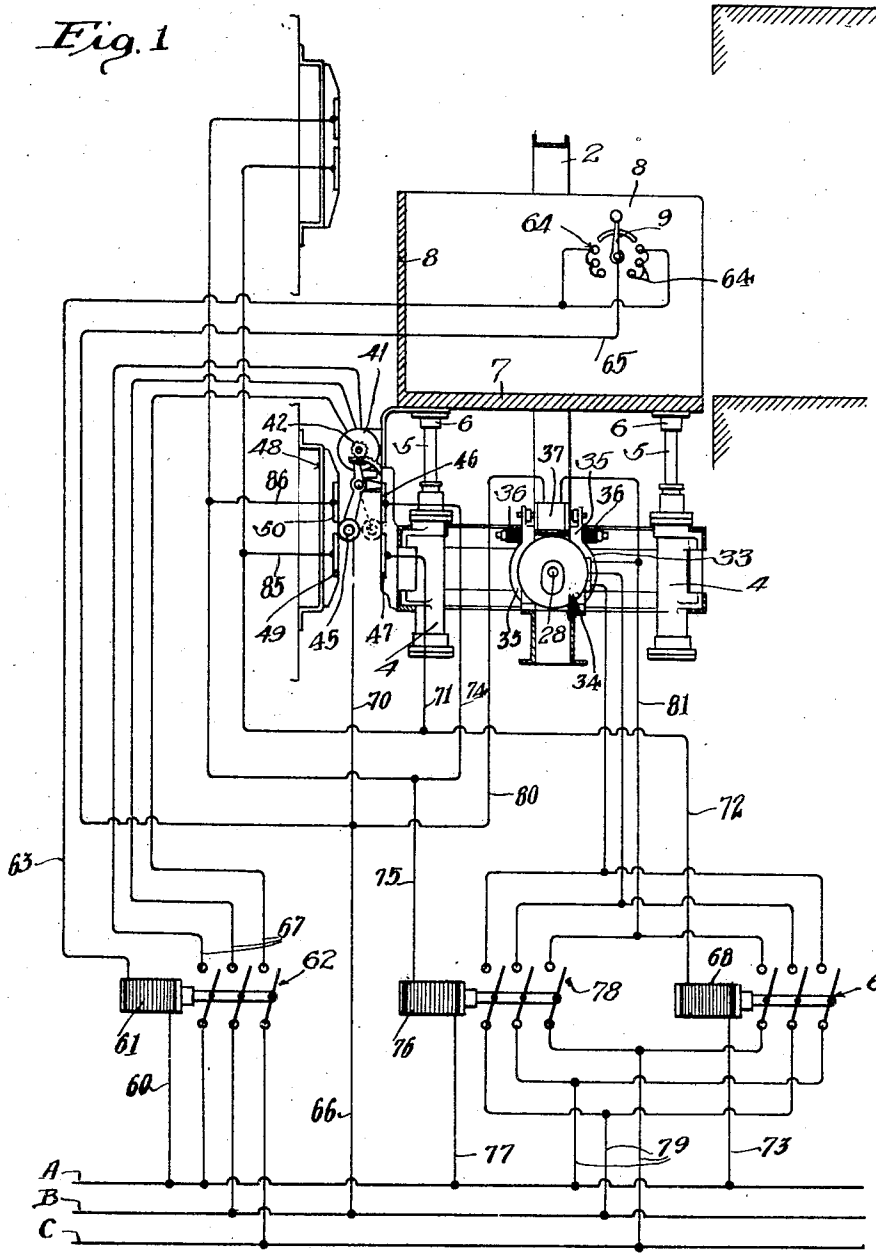
M. A. BAKER

ELEVATOR

Filed Oct. 21. 1926

4 Sheets-Sheet 1

Fig. 1



Inventor

Milo A. Baker

By Lyon & Lyon

Attorneys

May 8, 1928.

1,669,184

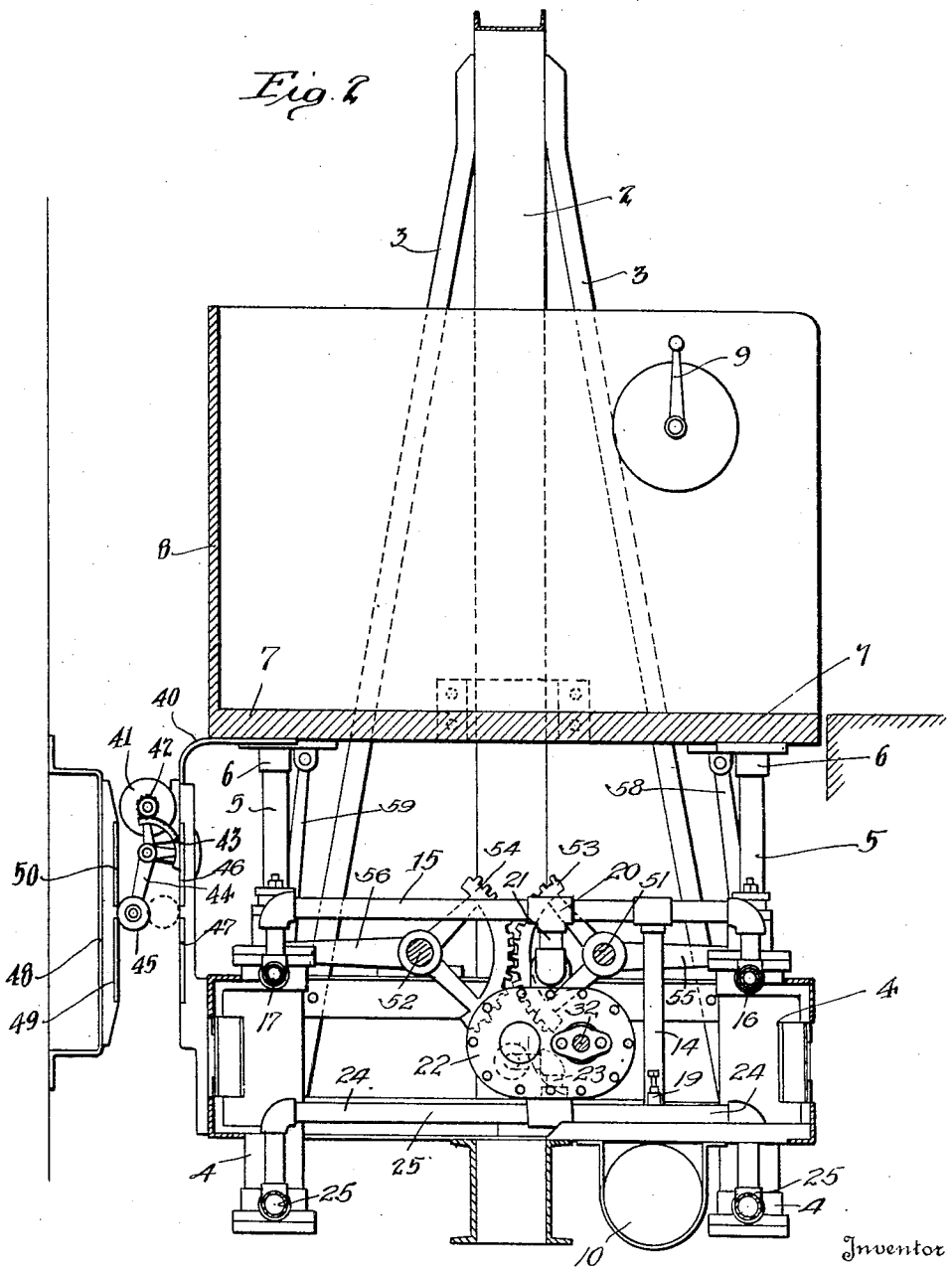
M. A. BAKER

ELEVATOR

Filed Oct. 21. 1926

4 Sheets-Sheet 2

Fig. 2



Inventor

Milo A. Baker

By Lyon & Lyon

Attorneys

May 8, 1928.

1,669,184

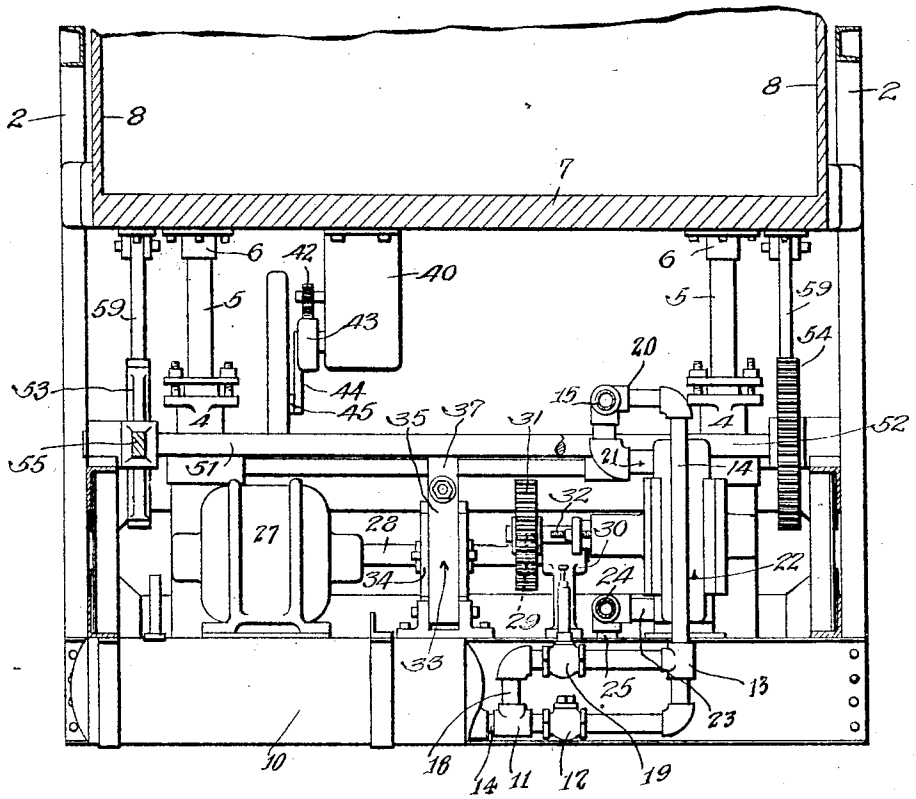
M. A. BAKER

ELEVATOR

Filed Oct. 21. 1926

4 Sheets-Sheet 3

Fig. 3



Inventor

Milo A. Baker

By Lyon & Lyon

Attorneys

May 8, 1928.

1,669,184

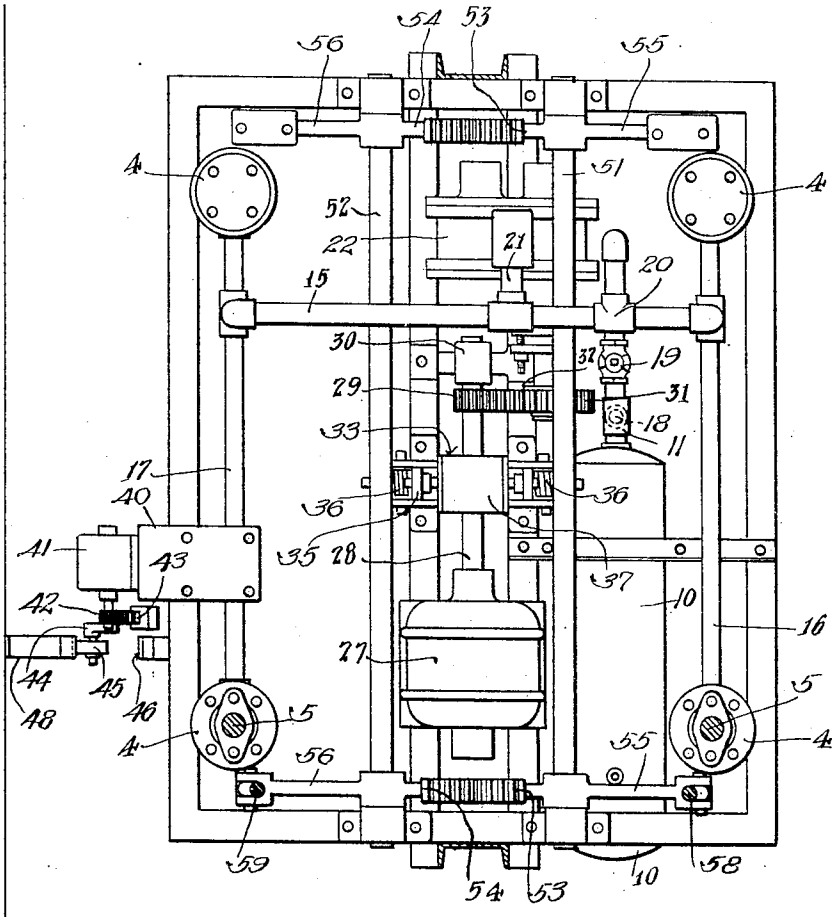
M. A. BAKER

ELEVATOR

Filed Oct. 21, 1926

4 Sheets-Sheet 4

Fig. 4.



Inventor

Milo A. Baker

By Lyon & Lyon

Attorneys

Patented May 8, 1928. 1,669,184

UNITED STATES PATENT OFFICE.

MILO A. BAKER, OF LOS ANGELES, CALIFORNIA.

ELEVATOR.

Application filed October 21, 1926. Serial No. 143,118.

This invention relates to elevators, and refers particularly to the type of elevator which is designed to automatically bring the elevator platform to a stop even or level with a landing.

In my copending application Serial No. 135,870, filed September 16, 1926, there is described an elevator in which the elevator car or cage is built separate from the elevator floor or platform so that a movement of the floor or platform relative to the car or cage may take place. In accordance with such copending application, there is described a suitable mechanism by which, after the car stops near a landing, the mechanism automatically moves the car platform or floor relative to the car in order to bring said car platform floor level with the landing. The device of said copending application was provided with motor driven racks for the movement of the floor relative to the car.

An object of the present invention is to provide an improved form of elevator of this type in which the movement of the car platform or floor relative to the car may be more readily accomplished with less vibration. In accordance with the present invention, the elevator car floor is mounted in the cage upon hydraulic cylinders which are connected with a source of hydraulic fluid adapted to be forced into the cylinders for elevating or lowering the car floor relative to the car, the control of the operation of such hydraulic cylinders being automatic and electrical. Moreover, the elevator of the present invention is provided with an equalizing device for insuring an equal elevation and lowering of all portions of the car floor or platform relative to the car so that the car floor or platform will be maintained level.

Various further objects and advantages of the present invention will be readily understood from a description of a preferred form or example of an elevator embodying the present invention. For this purpose, there is illustrated in the drawings the preferred form of an elevator which embodies the present invention.

In the drawings:

Figure 1 is a diagrammatic view of the elevator system showing the electrical connections,

Figure 2 is an elevation of the elevator mechanism,

Figure 3 is an elevation at right angles to Figure 2, and,

Figure 4 is a bottom view.

Referring to the drawings, the cage or car proper is largely omitted from the drawings to clarify the construction, the supporting structure for the car or cage only being illustrated. Said supporting structure comprises a rectangular frame 2 formed of channel irons by which the elevator may be suspended in an elevator well. There is also indicated braces 3, 3 for supporting the bottom of the car or cage rigid relative to the cage mounting frame 2. The floor of the car or cage mounts a plurality of hydraulic cylinders 4. The elevator illustrated is shown as provided with four of such hydraulic cylinders, one disposed near each corner of the floor of the cage. It is understood that any usual or customary type of hydraulic cylinder may be employed having inlets for introduction and discharge of liquid at both sides of the piston within the cylinders. Each of the cylinders have piston rods 5 extending vertically upward and at the top of said piston rods 5, there is provided collars 6 by which the piston rods are attached to the movable floor or platform 7. Preferably, said movable floor or platform 7 is provided with upwardly extending side walls 8, extending sufficiently above the floor so that upon movement of said movable floor relative to the case, the passengers or freight will not come in contact with any of the sides of the car proper. Mounted on one of said sides 8 is the operator's switch 9 of any usual or preferred construction which serves as a means for controlling the motion of the car or cage proper. Inasmuch as the present invention is not in any way dependent upon any particular form of mechanism for elevating the car or cage and any customary or preferred mechanism may be so employed, said mechanism is not herein described.

The hydraulic cylinders 4 are preferably provided with liquid from a reservoir 10 which preferably is an oil reservoir. The oil reservoir 10 is connected by a line 14 through a T 11, check valve 12, and T 13 to a horizontal line 15. Said line 15 distributes

the hydraulic fluid to the lines 16 and 17, each of which lines connect with a pair of hydraulic cylinders 4 above the pistons of said cylinders. The line 14 is also connected through line 18 with a relief valve 19 and hence back through T 13 to line 14.

The line 15 is also provided with a T 20 by which it is connected to a line 21 with a pump 22. Said pump is but diagrammatically indicated; any reversible pump adapted for placing pressure upon a liquid may be employed. Said pump is connected at its opposite end with a line 23 which is connected by the lower horizontal line 24 connected with a pair of similar branch lines 25 which are each connected with a pair of the hydraulic cylinders 4 below the pistons of said cylinders.

The pump 22 is provided with suitable driving means such as the electric motor 27. The electric motor 27 and the pump 22 are indicated as preferably connected together as follows: The shafts 28 of the motor is preferably provided with a gear 29 and a bearing 30 supported by the frame of the car. The gear 29 in turn engages a gear 31 on the pump shaft 32.

There is also preferably provided a brake for holding the motor shaft 28 and pump shaft 32 stationary, said brake being indicated at 33 and preferably is formed by a brake drum 34 rigid with the motor shaft 28 and by a pair of hinged brake arms 35, normally urged to the braking position by springs 36 and adapted to be released by an electro-magnet 37.

The movable floor 7 of the car is indicated as mounting a bracket 40 supporting a small electric motor 41 or other suitable switch controlling means. Said motor 41 is provided with a pinion 42 on its motor shaft which is engaged by sector gear 43. The sector gear 43 in turn is rigid with a downwardly extending arm 44 which mounts a contact roller 45.

On the side of the car or cage is positioned up and down contact plates 46 and 47 respectively, adapted to engage said roller 45 in one of its swinging positions whenever the movable floor of the car is in other than its normal position relative to the car.

In addition to the contact plates 46 and 47, there are provided the brackets 48 in the hatch-way positioned adjacent each landing. Said brackets 48 carry up and down contact plates 49 and 50 respectively, which contact plates are adapted for engagement with the roller 45 in its outer position whenever the car is stopped at a landing with the car floor 7 imperfectly leveled therewith.

Unless suitable means are provided, the elevator car floor 7 would not necessarily be maintained level by the piston rods 5. Accordingly, there is preferably provided equalizing levers or means for this purpose. Said equalizing means preferably comprise a pair of horizontally alined equalizing shafts 51 and 52, each of which equalizing shafts are provided with sector gears 53 and 54 at their ends, the sector gears of the two shafts 51 and 52 engaging. The sector gears 53 and 54 are respectively rigid with link arms 55 and 56 which in turn are connected with link arms 58 and 59 respectively which latter link arms are all pivotally attached to the bottom of the platform frame 7. By the thus described means, it will be seen that any motion attempted to be imparted to one portion of the car platform 7 will be thereby transmitted to the link arms, the sector gears, and to the other portions of the car platform 7 so that said motion will always be equalized to maintain the car platform 7 level.

Referring more particularly to Figure 1 of the drawings, the operation of the elevator car is as follows: The movable floor 7 of the elevator car is leveled automatically with the landings when the car stops at the landings and automatically returned to its normal position in the car when the car leaves the landings through the following means. The control mechanism of the floor is actuated by current from the three-phase mains A, B, and C. The main A is connected by line 60 with a magnet 61 of a control switch 62 for the motor 41 of the contact roller 45. Said magnet 61 is also connected by a line 63 to the contacts 64 on the operator's switch 9 within the car. The handle of the operator's switch is connected by a line 65 and the line 66 with the main B. Accordingly, whenever the operator's switch 9 is moved in either direction, either to start the car up or down, a circuit is closed through the coil 61 of the motor control switch 62, which closes said switch, thereby passing current through three-phase lines 67 to the motor 41. Said motor 41 then rotates until it drives the contact roller 45 into contact with the side of the car platform frame. At this time, the contact roller 45 will engage either the up contact 47 or the down contact 46 on the car platform frame unless the floor 7 of the car is in the normal position. In case said contact roller 45 engages, for example, the up contact 47, the circuit will be closed through the coil 68 of an up switch 69 which controls main floor operating motor 27. The circuit for said switch is from main B, line 66, line 70, contact roller 45, up contact 47 on the car frame, lines 71 and 72 through coil 68 and the line 73 to main A. If the roller 45 had in turn made engagement with the down contact 46, a similar circuit from main B through lines 66 and 70, roller 45 down contact 46, lines 74 and 75, coil 76, and line 77 to main A, would be established for operating a down switch 78 for the main

floor operating motor 27. The up and down switches 69 and 78 control the passage of current through three-phase lines 79 leading to said motor 27 and accordingly the operation of the up or down switches 68 or 79 causes the motor 27 to drive the pump 22 to circulate liquid, such as oil, from the liquid tank 10 to the hydraulic pistons 4 of the car whereby the platform 7 of the car is driven up or down relative to the remainder of the car in order to bring said floor to a normal position in the car. When the floor reaches said normal position, the contact roller 45 drops off its contact thereby breaking the circuit to the up switch 69 or down switch 78 and the motor 27 will stop.

Simultaneously with the actuation of either the up switch 69 or the down switch 78, a circuit is established for energizing the coil 37 of the brake 33 on the main motor 27. Said circuit is from main B to lines 66 and 80, coil 37 of the brake 33, line 81, and hence to either up switch 69 or down switch 78. Accordingly, the deenergizing of the up switch 69 or down switch 78 when the contact roller 45 rolls off its engaged contact removes the current supply from coil 37 and causes the brake 33 to be applied to maintain the car floor in its normal position within the car.

Whenever the lever of the operating switch 9 of the car is centered in order to stop the elevator car at a landing, the circuit is broken which energizes coil 61 of the control switch 62. Accordingly, the contact roller motor 41 is no longer energized and the contact roller 45 will swing outwardly from the car in position to engage the cams on the brackets 48. Hence, if the car is stopped by the operator with the floor 7 of the car not level with the landing, the contact roller 45 will make engagement with either the up contact 49 or the down contact 50 on the brackets 48. The up and down contacts 49 and 50 are connected respectively through lines 85 and 86 respectively, with the up and down switches 69 and 78 respectively. Accordingly, depending upon whether the contact roller 45 engages the up or down contact, the up switch 69 or down switch 78 will be closed. As before, the closing of either the up switch 69 or the down switch 78 will drive the elevator floor 7 upwardly or downwardly until, in this case, the car platform 7 is brought level with the landing. At such time, the roller 45 rolls off the contacts 49 and 50 and the up or down switch is opened and the elevator motor 27 stops. The brake 34 is applied and released from said motor 27 during this operation in the same manner as described in connection with the bringing of the car floor to a normal position when the car leaves a landing.

The operation of the motor 27, in driving the pump 22, elevates and lowers the car platform 7, as described in the previous operation, as follows: When the motor is operated to elevate the car platform, the pump 22 draws liquid from the tank 10 through the line 14, through the pump, and forces said liquid through the lines 25 into the bottom of the hydraulic cylinders 4. At the same time, the liquid from above the pistons in the hydraulic cylinders will be drawn into the pump 22. When the pump is reversed to lower the platform, the liquid will be withdrawn from lines 25 into the lower end of the pump and forced out of the top of the pump through the lines 15 in the top of the hydraulic cylinders. At this time, the check valve 12 prevents the liquid from being forced back into the tank 10 but upon application of an excess pressure, the relief valve 19 will yield for by-passing of some of the liquid being pumped.

It will be seen from the foregoing description that I have provided an apparatus for accurately leveling the floor of an elevator car with a landing by hydraulic means, which means is automatically electrically controlled and is not dependent on moving the elevator car as a whole, or in any way connected or dependent upon the mechanism for moving the elevator car. Moreover, the motion of the car floor 7 relative to the car may be accomplished without perceptible jerking or jarring and without the floor deviating from a level position.

While the particular form of the invention herein described is well adapted for carrying out the objects of the present invention, various embodiments may be made without departing from the invention, and the invention includes all such modifications and changes as come within the scope of the appended claims.

I claim:

1. An elevator comprising an elevator car, a floor for the car, hydraulic means between said floor and car operative to vertically move the floor relative to the car, means for automatically actuating said hydraulic means to move said floor relative to the car to level the floor with a landing whenever the car stops adjacent a landing, and means for equalizing the motion of all portions of the floor.

2. An elevator comprising an elevator car, a floor for the car, hydraulic means mounting the floor on the car adapted to vertically move the floor relative to the car, means for automatically actuating said hydraulic means for returning the floor to a normal position in the car whenever the car leaves a landing, and equalizing means for equalizing the motions of all portions of the floor.

3. An elevator comprising an elevator car, a floor for the car, hydraulic means mounting said floor upon said car adapted for ver-

tically moving the floor relative to the car, means for automatically actuating said hydraulic means to level the floor with a landing whenever said car stops at a landing, means for automatically actuating said hydraulic means for returning the floor to a normal position in the car whenever the car leaves a landing, and equalizing means for equalizing the motion of all portions of the floor.

4. An elevator comprising a car, a floor for said car, hydraulic means movably mounting said floor on said car, a switch carried by the car, a cam in the hatch-way engageable with said switch in the outer position, contacts carried by the car to be energized when said switch is in a retracted position, circuits controlled by the engagement of said switch with said cam for energizing said hydraulic means when the car stops at a landing for leveling the floor with the landing, and circuits controlled by the engagement of said hydraulic means for normalizing the floor in the car when the car leaves a landing.

5. An elevator comprising a car, a floor for said car, hydraulic means movably mounting said floor on said car, a switch carried by the car, a cam in the hatch-way engageable with said switch in the outer position, contacts carried by the car to be energized when said switch is in a retracted position, circuits controlled by the engagement of said switch with said cam for energizing said hydraulic means when the car stops at a landing for leveling the floor with the landing, circuits controlled by the engagement of said hydraulic means for normalizing the floor in the car when the car leaves a landing, and equalizing means for normalizing the motion of all portions of the floor.

6. An elevator comprising an elevator car, a floor for said car, hydraulic means movably mounting said floor on said car, a pump and motor carried by said car operative to actuate said hydraulic means, and electrical control circuits operative for energizing the motor to level the floor with a landing when the car stops adjacent the landing.

7. An elevator comprising an elevator car, a floor for said car, hydraulic means movably mounting said floor on said car, a pump and motor carried by said car operative to actuate said hydraulic means, and electrical circuits for energizing said motor for bringing the floor to a normal position within the car when the car leaves the landing.

8. An elevator comprising an elevator car, a floor for said car, hydraulic means movably mounting said floor on said car, a pump and motor carried by said car operative to actuate said hydraulic means, electrical control circuits operative for energizing the motor to level the floor with a landing when the car stops adjacent the landing, and electrical circuits for energizing said motor for bringing the floor to a normal position within the car when the car leaves the landing.

9. An elevator comprising an elevator car, a floor for said car, hydraulic means movably mounting said floor on said car, a pump and motor carried by said car operative to actuate said hydraulic means, electrical control circuits operative for energizing the motor to level the floor with a landing when the car stops adjacent the landing, electrical circuits for energizing said motor for bringing the floor to a normal position within the car when the car leaves the landing, and equalizing means for equalizing the motion of all portions of the car floor.

10. An elevator comprising an elevator car, a floor for said car, hydraulic cylinders and pistons mounted operatively between said floor and car, the piston being carried by one of said parts and the cylinder by the other of said parts, and means for automatically actuating the pistons to move said floor relative to the car to level the floor with the landing whenever the car stops adjacent the landing.

11. An elevator comprising an elevator car, a floor for said car, hydraulic cylinders and pistons mounted operatively between said floor and car, the piston being carried by one of said parts and the cylinder by the other of said parts, means for automatically actuating the pistons to move said floor relative to the car to level the floor with the landing whenever the car stops adjacent the landing, and means for automatically actuating said hydraulic pistons for returning the floor to normal position in the car whenever the car leaves a landing.

MILO A. BAKER.