C. H. OCUMPAUGH.

ELEVATOR.

APPLICATION FILED AUG. 27, 1907.

920,630. Patented May 4, 1909.

2 SHEETS—SHEET 1.

FIG. 1.

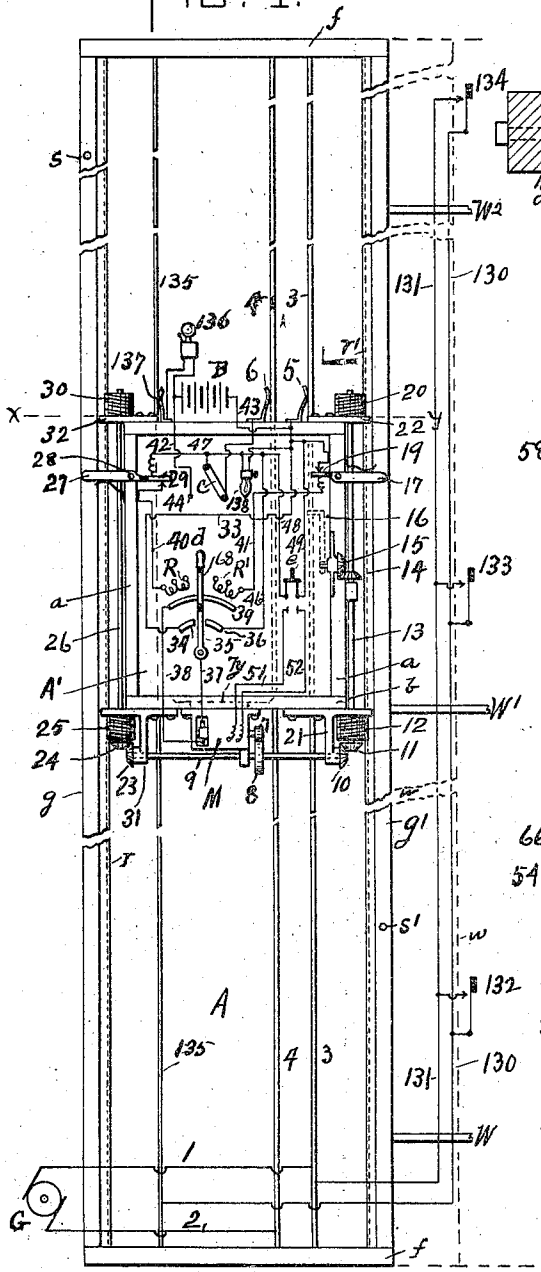


FIG. 2.

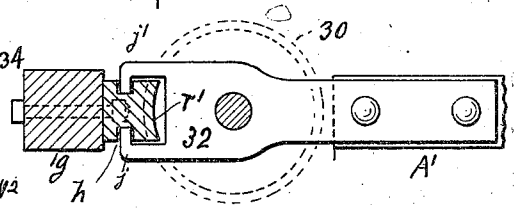


FIG. 3.

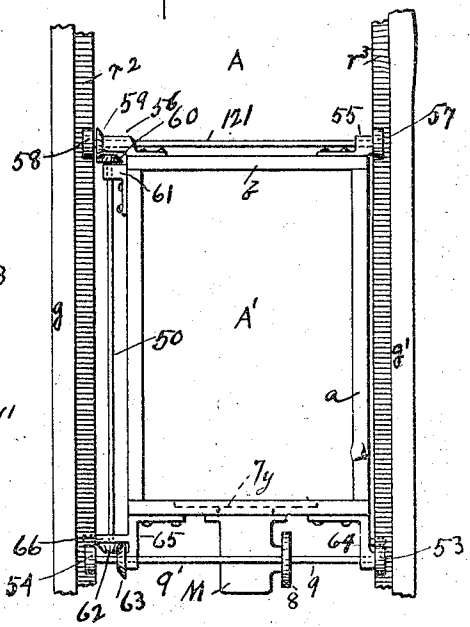
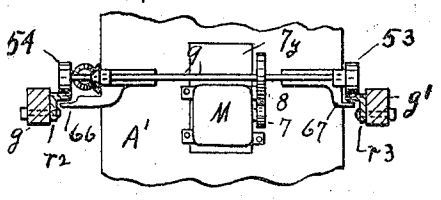


FIG. 4.



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2 SHEETS—SHEET 2.

FIG. 5.

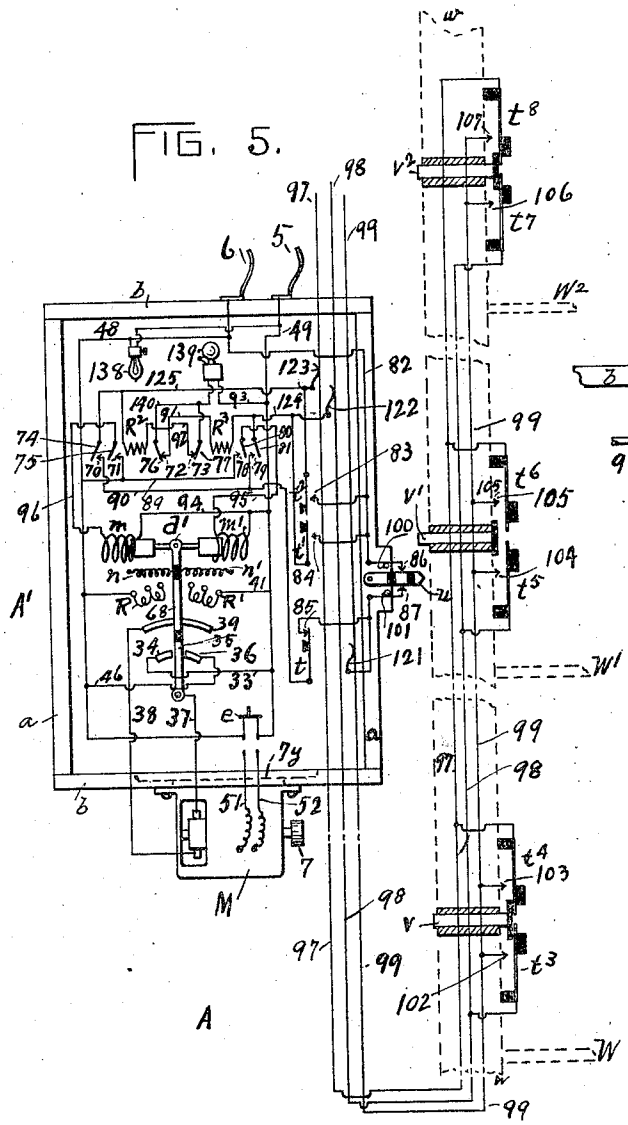
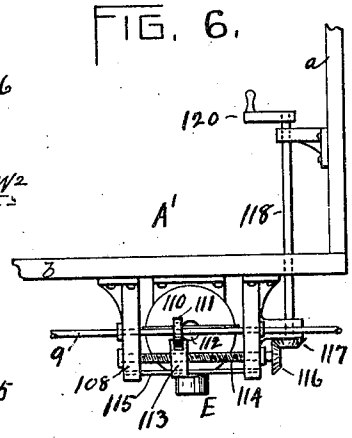


FIG. 6.



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UNITED STATES PATENT OFFICE.

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ELEVATOR.

No. 920,630. Specification of Letters Patent. Patented May 4, 1909.

Application filed August 27, 1907. Serial No. 390,391.

To all whom it may concern:

Be it known that I, CHARLES HERBERT OCUMPAUGH, a resident of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Elevators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

This invention relates to elevators of the class carrying their own motors.

The main objects of the invention are to provide efficient means for raising and lowering elevators, which means shall give superior steadiness to movement, and added safety.

It is an object of the invention to provide such an operating mechanism for elevators that no extra safety devices will be needed since the breakage of any part of the hoisting mechanism will not release the elevator and permit it to drop, but such elevator will be held in place by the remaining mechanism normally used to operate the elevator.

Another object is to provide means for operating an elevator of the class described without an attendant on the elevator, that is, for bringing the elevator to any floor of a building as desired, by means of mechanism located upon such floor, which when operated automatically actuates the motor located upon the elevator to bring the elevator to such floor and stop it there.

Another object is to provide improved means for limiting the motion of an elevator at the top and bottom of the shaft, such means preventing the operation of the elevator in the direction of such stop when in a limiting position while at the same time permitting such elevator to be freely operated in the opposite direction.

A further object is to provide an auxiliary means for operating the elevator in case the main operating means should fail.

A further object is to provide means in connection with the automatic operation of an elevator from any of the several floors of a building whereby when the elevator has been started toward any floor from either direction it is impossible to reverse the direction of motion of the elevator from that or any other floor until the elevator automatically comes to a stop at the floor calling it; however, the elevator may be stopped and reversed by those on the elevator at any instant irrespective of the direction or location of any automatic call for the elevator.

A further object is to provide means for furnishing light, power, control, signals, etc. for and to the elevator by means other than the customary cables thus doing away with the danger of breakage, and means having longer life than the swinging cables.

Further objects can be seen and understood from the drawings and specification.

The invention consists in the construction hereinafter described and particularly pointed out.

The several drawings illustrating my invention are as follows:

Figure 1 is a diagrammatic elevation of three floors, an elevator well with an elevator therein and guideways in the well, the elevator being adapted to be either power or manually operated. Fig. 2 is an enlarged horizontal sectional view of the left hand guideway and parts coöperating therewith, located immediately below the dotted line *x*—*y* in Fig. 1. Fig. 3 is a view of an elevator and guideways similar to Fig. 1 excepting that another form of gearing is used to move the elevator. Fig. 4 is a bottom view of the parts shown in Fig. 3. Fig. 5 is a view similar to Fig. 1 of an elevator well, an elevator therein, and showing several floors with means for automatically operating the elevator either from any one of the several floors or from the elevator itself. Fig. 6 is a detail view showing means for adapting an internal combustion motor to drive an elevator of the type shown in Figs. 1 and 3.

Similar characters refer to similar parts throughout the several views.

Referring to Figs. 1 and 5, the three floors are represented by, W, W^1, W^2, while A is the elevator well and A^1 is the elevator which comprises a frame work consisting of vertical members *a*, and horizontal members *b*, and from the under side of such elevator an electric motor M is supported, pinion 7 of which meshes with gear 8 carried by shaft 9 in bearings in brackets 21 and 31 supported from the elevator. 7 *y* is a trap or door in the floor of the elevator, which when raised gives access to the motor irrespective to the position of the car in the well. Shaft 9 has secured to its ends bevel gears 10 and 23 adapted to coöperate with similar bevel gears 11 and 24 respectively carried by the opposite shafts 13 and 26

supported in bearings in brackets 21, 31, 22 and 32. The shaft 13 as shown in this case carries near the ends thereof worm gears 12 and 20 adapted to engage a worm rack r' supported by the guideway g'. The shaft 26 similarly carries worms 25 and 30 adapted to engage the opposite worm rack r supported from guide way g. There is thus a driving worm or gear on each side of the elevator car at the top and preferably also at the bottom, and this, particularly the worms or gears at the car top is important since they give steadiness to the car and increased safety. The worms need not be as short as shown but preferably are not extended to meet. The bearing brackets 21, 22, 31 and 32 engage the rack bars r' and r. The lugs j, j' are formed on the split extending end of bracket 32 and these lugs engage grooves h in the sides of rack bar r the purpose of such construction being to insure the proper engagement of the worm and rack at all times. A method of securing the rack bar r to the guideway g is also shown. The guideways are held in proper position to each other at the top and bottom by members f. When the power is furnished to the motor from the exterior of the elevator, as from generator G, use is made of trolley bars or conducting feed rails 3 and 4 supported from the side of the elevator well and insulated therefrom in any convenient manner, not shown, and upon these bars or rails sliding contact shoes 5 and 6 or the like are arranged to move. (It is understood that the rack bars r may also be used as feed rails in place of rails 3 and 4 if so desired).

To operate the elevator the switch e is first closed, thereby closing a circuit as follows: generator G, wire 1, rail 3, shoe 5, wire 49, switch e, wire 52 through the field coils of the motor M to wire 51, switch e, wire 48, wire 47, switch c, shoe 6, rail 4, wire 2 back to generator G. To move the elevator upward the controller lever d is moved to the left thereby closing a circuit through the motor armature as follows: generator G, wire 1, rail 3, shoe 5, wire 33, contact 34, insulated member 35 carried by lever d, wire 37 to and through the motor armature, wire 38, contact 39, insulated member 68 on lever d, resistance R, wire 40, contact 29, wire 47, switch c, shoe 6, rail 4, wire 2 back to generator G. By regulating the amount of resistance R in circuit with the armature, the speed of the motor M and thus also the speed of the worm gears 12, 20, 25 and 30 may be varied as desired, and hence the speed of the elevator.

A stop s projecting from the guideway g is provided near the top of such guideway to engage the lever arm 27 pivoted to the member a at 28 and thereby open contact 29, and thus opens the armature circuit just described. when the elevator reaches its uppermost position which effectually prevents again closing such armature circuit in the same direction, while the contact 29 is open. It is, however, possible under these conditions to reverse the direction of the motor. This is accomplished by moving the controller lever d to the right closing the armature circuit as follows: generator G, wire 1, rail 3, shoe 5, contact 19, wire 41, resistance R^1, member 68, contact 39, wire 38, to and through the armature to wire 37, member 35, contact 36, wire 46, wire 47, switch c, shoe 6, rail 4, wire 2 back to generator G. It will be noticed that for this last circuit the direction of current through the armature is reversed from that described for upward motion of the elevator, and hence for this last described condition the elevator will be moved downward until the lever arm 17 pivoted to the member a engages limiting stop s^1 projecting from guideway g^1 and thereby opens the armature circuit last traced at contact 19. Contacts 19 and 29 are normally maintained closed as indicated by the action of suitable springs as a result of which, when one of such contacts is opened by the corresponding limiting stop the other of such contacts is closed and permits the operation of the elevator in the reverse direction.

Besides the gears described the shaft 13 carries a bevel gear 14 engaging a similar bevel gear 15 supported by a suitable bearing from the member a and adapted to be operated by a suitable crank 16, whereby, should the motive power fail for any cause an auxiliary means is provided by which the elevator may be moved manually to the nearest floor and the passengers or cargo discharged.

A battery either primary or secondary, indicated diagrammatically at B may be carried in any suitable place on the elevator, and if desired the generator G may be dispensed with, in which event the switch e is moved to contact 44 and the circuits previously traced from shoe 5 to and through the several paths, now start from battery B, wire 43, to and through precisely the same paths as before, back to switch e, contact 44, wire 42 to battery B. Thus a means is provided for making the motive power of the elevator entirely self-contained and the elevator a self-propeller. It will be seen that the same circuit breakers, 27, 17 and stops s, and s', automatically render the motor inoperative at the proper time whichever source of power is being used. Also that when the battery on the elevator is in use all the power circuit is confined to the elevator. Another method for accomplishing this phase of my invention is shown in Fig. 6. In this modification an internal combustion motor E is supported from the under side of the elevator and is provided

with a driving disk 110, having a recessed center 112, such disk being adapted to be engaged by a friction roller 111 splined upon a shaft 9 supported in suitable bearings in brackets 108 and prevented from longitudinal motion therein by suitable collars. A yoke 113 is adapted to engage the roller 111 on either side, such yoke being prevented from being disengaged from such roller by the guide bar 115 upon which it slides and the screw 114 threaded through such yoke. The bar 115 and screw 114 are supported in the brackets 108 and the screw 114 is prevented, from longitudinal motion therethrough and carries on its right hand end a bevel gear 116 adapted to coöperate with a similar bevel gear 117 carried on the lower end of a shaft 118 supported in suitable bearings as indicated and carrying at its upper end a crank 120. From the construction just described, it is apparent that, when the gas motor E is started, which may be accomplished in any well known manner, preferably with the roller 111 opposite the recess 112, the roller 111 may be moved across the face of the disk 110 by turning the crank 120 and thus the shaft 9 may be rotated in either direction at any desired speed as a result of which the elevator may be freely operated as desired as the shaft 9 may bear the same relation to the driving gears of the elevator as shown in Fig. 1 or in Fig. 3.

In Figs. 3 and 4 a form of gearing is shown in which the shaft 9 carries at its end pinions 53, 54 adapted to coöperate with the straight tooth racks r^3 and r^2 secured to the guideways g^1 and g respectively. The shaft 9 also carries a bevel gear 63 adapted to coöperate with a similar bevel gear 62 secured to the lower end of shaft 50 and to the upper end of which a similar bevel gear 60 is secured which is adapted to engage a similar bevel gear 59 secured upon the shaft 121 to the ends of which pinions 57 and 58, similar to and for the same purpose as pinions 53 and 54, are secured. The bearings of the several shafts just described are suitably supported by brackets 64, 65, 55, 56 and 61, all of which except bracket 61, have members as 66 and 67 in Fig. 4, extending on the rear side of the racks r^3, r^2 to maintain the pinions 53, 54, 57, 58 in engagement at all times with such racks.

In Fig. 1 I have shown a signaling system for calling the elevator from any of the several floors as follows: Buttons 132, 133, 134 are located on the different floors and serve to close a signaling circuit from any suitable battery B located on the elevator car A^1, the current taking the following course. Battery B, wire 43, shoe 5 rail 3, wire 131, button 132, wire 130, trolley wire or rail 135, shoe 137, bell 136, back to battery B. Bell 136 is preferably of the vibrating type and the particular floor from which the signal is sent may be indicated by any suitable code of rings.

Means for lighting the elevator are indicated in Fig. 1, consisting of a lamp 138 bridged between wires 33 and 47 whereby light may be had as desired by turning the key connected with the socket of such lamps. As an alternate means of wiring for a light, a light 138 is shown in Fig. 5 as bridged between the wires 48 and 49.

In Fig. 5 that part of my invention is shown in which it is possible to automatically operate the elevator actuating mechanism from any floor and to cause the elevator to stop at such floor. In this connection the operating gearing is not shown since it is the same as that already described, and it being merely necessary to provide means for properly operating the motor M. The generator G, feed rails 3 and 4, battery B and switch c are also omitted for the sake of clearness, since obviously any or all of these are used in this connection as already described for Fig. 1 and hence we will assume that current is properly supplied to the elevator circuits by contact shoe 5 and returned therefrom to the generator by contact shoe 6.

To place the elevator in operative condition the switch e is closed thereby closing the field circuit of motor M in the same manner already described excepting that from wire 48 in this case the current flows directly to shoe 6.

Buttons t^3, t^4, t^5, t^6, t^7, t^8, are provided, two on each floor, the upper one on any floor being for the purpose of bringing the elevator up to the corresponding floor, the lower button being for the purpose of bringing the elevator down to the corresponding floor. Buttons t^2, and t^1, are installed on the elevator so the passengers once in the elevator after it has responded to his operation from any floor, may move the elevator up or down respectively. A button t is provided to stop the elevator at any time desired. Assume that the button t^6 has been depressed to bring the elevator to that floor. This closes contact 105 and at the same time pushes out the sliding bar c^1 against the slightest resisting friction of its support. The dotted lines w represent the thickness of the wall of the elevator well. The closing of contact 105 closes the following circuit: shoe 5, wire 49, wire 93, bell 139, wire 140, contact 73 of relay R^3, wire 92, winding of relay R^2, wire 125 sliding shoe 123, trolley wire or rail 97, button t^6, contact 105, trolley wire or rail 99, sliding shoe 121, contact 87, contact 86, wire 82 to shoe 6. This energizes relay R^2 thus attracting its armatures 74, 75 and 76 thus closing contacts 70 and 71 and opening contact 72. The closing of contact

70 closes a locking circuit for relay R^2 as follows: shoe 5, wire 49, wire 93, bell 139, wire 140, contact 73, wire 92, winding of relay R^2, wire 125, contact 70, wire 90, contact 85, contact 87, contact 86, wire 82 to shoe 6. The closing of contact 71 closes a circuit as follows: shoe 5, wire 49, wire 94, solenoid m, wire 96, contact 71, wire 48 back to shoe 6. Thus the controller lever d^1 is moved over to the left against the action of spring n^1 and closes the motor armature circuit as follows: shoe 5 wire 49, wire 33, contact 34, insulated member 35 on lever d^1, wire 37, to and through the armature of the motor, wire 38, contact 39, insulated member 68 on lever d^1, resistance R, wire 48 to shoe 6. Thus the motor is operated as before and the elevator moves upward until the lever u strikes the bar v^1 which causes the lever to turn slightly on its pivot before the beveled cam end of such lever u passes by the corner of the end of the bar v^1 and thereby pushes such bar v^1 back in its support so it will not again engage the lever u and move it against the spring resistance of contacts 86 and 87 to open either of such contacts unless such bar is again projected into the path of the lever u by the operation of either of the buttons t^5 or t^6. The cam end of the lever u is symmetrical and is designated to first engage the stop bars positively and as a result to rotate such lever somewhat before the sharp corners of the lever end and bars pass each other and the cam surface of the lever comes in contact with the end of the bars to return them so the side faces of the lever cannot again engage the side faces of the bars unless one of such bars is again moved to its operative position. The opening of the contact 86 above mentioned during the upward movement of the elevator opens the energizing circuit of relay R^2 and thus the armature circuit of the motor, but the inertia of the moving parts is sufficient to carry the elevator the slight amount required to cause the passing of the corners of the side faces of the lever u and bar v^1 above described and the return of such bar v^1 to its normal position, which return is facilitated by the spring of contact 87.

It is designed in some cases, particularly with slow moving elevators, to have the elevator stop with the lever u squarely opposite one of the bars v, v^1, v^2, from which it will be observed, I have provided means by which the operation of the elevator is prevented when it is at any floor unless the passenger calling it to that floor first gets into the elevator and operates the button inside of the same. In such case the parts u, v, etc. would be of such size and arrangement, and the speed of the elevator so adjusted that the momentum would not carry the lever u by the bar v v^1 or v^2. The person calling on entering the elevator would start it in the direction opposite from which it came to his floor in order to separate lever u from bar v, etc., after which if desired he could reverse and move again in the first direction.

Suitable stops 100 and 101 are provided to prevent contacts 86 and 87 following up the motion of lever u and the contact on the side away from such motion is opened when such lever is rotated. The momentary opening of contact 86 opens the locking circuit of the relay R^2, whose armatures thus drop back opening the locking circuit at contact 70 and the circuit of solenoid m at contact 71. When the contact 86 is again closed the relay R^2 is not again energized since contact 70 is open. The opening of the solenoid circuit releases the lever d^1 which is returned to its normal position by spring n^1 thus breaking the armature circuit. If the button t^3 were depressed, a circuit would be closed as follows: shoe 5, wire 49, wire 93, bell 139, wire 140, contact 72, wire 91, winding of relay R^3, wire 124, sliding shoe 122, trolley wire or rail 98, button t^3, contact 102, trolley wire or rail 99, sliding shoe 121, contact 87, contact 86, wire 82 back to shoe 6. Thus relay R^3 is energized and pulls up its armatures 77, 80, 81 and closes contacts 78 and 79 and opens contact 73. The closing of contact 79 closes a locking circuit for relay R^3 as follows:—shoe 5, wire 49, wire 93, bell 139, wire 140, contact 72, wire 91, winding of relay R^3, contact 79, wire 90 button t, contact 85, contact 87, contact 86, wire 82 to shoe 6. The closing of contact 78 closes a circuit as follows: shoe 5, wire 49, solenoid m^1, wire 95, contact 78, wire 89, wire 48 back to shoe 6. Thus solenoid m^1 is energized and controller lever d^1 is moved to the right against the action of spring n closing the armature circuit of motor M as follows: shoe 5, wire 49, wire 41, resistance R^1, member 68, contact 39, wire 38 to and through the motor armature, wire 37, member 35, contact 36, wire 46, wire 48 to shoe 6. It will be noticed that the flow of the current through the armature is now in the reverse direction from that resulting from the operation of the button t^6 and therefore the elevator will be caused to travel in a downward direction until the lever u engages the bar v which was pushed out by the operation of the button t^3, and the contact 87 is thereby opened and hence the locking coil circuit of relay R^3 and also the energizing circuit of solenoid m^1 are opened which permits the spring n to return the lever d^1 to its normal position and thus break the armature circuit. Obviously with this mechanism limiting stops at the top and bottom of the shaft can be made use of, if desired, as indicated in Fig. 1.

It will be noticed that the buttons t^4, t^6, t^8

when depressed close contacts 103, 105 and 107 and thereby perform exactly the same function electrically,—that is, the energization of relay R^2 while the buttons t^3, t^5, t^7 serve to close contacts 102, 104, 106 and thereby perform the same function electrically namely, the energization of relay R^3. The selection of the floor in any case is accomplished mechanically by the engagement of the particular stop bar v, v^1, v^2 operated, with the lever u. It will also be noticed that the buttons t^1 and t^2 in closing contacts 84 and 83 serve the same purpose as t^3 and t^4 except that the contacts 83 and 84 are inside of contacts 86 and 87 and therefore the buttons t^1 and t^2 may be operated and the corresponding relays energized whether the contacts 86 and 87 are open or not.

Locking circuits are provided for the relays so that a single impulse from any of the operating buttons may serve to establish and maintain a desired operating condition until such condition is interrupted either by the proper stop bar or the stop button on the elevator.

It will be noticed that both locking circuits are closed through contacts 85, 86, and 87, as a result of which, if button t is pressed for any operating condition the relay locking circuit is at once opened and the operating condition is interrupted. If either contact 86 or 87 is open the elevator can only be operated in either direction by holding the buttons t^1, t^2 depressed since no locking circuit can be complete with the contacts 86 or 87 open. Thus the buttons t, t^1, t^2 furnish a means for completely controlling the operation of the elevator from within the same.

The energizing circuit of each relay is complete through a back contact on the other relay so as to prevent the operation of either relay when the other is energized, and it will be noticed that this circuit is completed in each case through the bell 139, which, as here shown, is of the single stroke variety and is used to give an audible indication on the elevator, it of course being understood that if preferred a visible or a combined visible and audible signal may be used in place of the bell 139, or, if preferred any of the well known electrical signaling or indicating devices may be used, but preferably with a moving contact between the push buttons on the different floors and the signal on the elevator as, for example, described in these specifications.

I do not wish to limit myself to the exact construction or detail as shown in the drawings and specifications as the entire invention is capable of many modifications.

Having described the invention what I claim is,—

1. The combination of an elevator well, a rack bar fixedly attached to the well, an elevator, a rotary support connecting the rack bar and the elevator, a motor on the elevator connected to and adapted to rotate the support, and an alternative independent means on the elevator for rotating the same support and thus raising or lowering the elevator.

2. An elevator well, a rack therein, an elevator, a motor thereon, means operated by the motor and comprising a vertical shaft and worm attached to the elevator for raising and lowering it, and manually operated means adapted to turn the same vertical shaft and worm for raising and lowering the elevator independently of the power motor.

3. An elevator well extending through several floors, an elevator, a motor therefor, controlling circuits extending to said floors and comprising two circuit closers at each floor, one for raising and one for lowering the elevator, a device at each floor normally out of the path of the elevator but moved into said path by operation of such circuit closers, and motor-stopping circuit breakers in said controlling circuits on the elevator and operated to open one circuit when the elevator is going up by operation of said device on the circuit breaker and to open the other circuit in coming down.

4. An elevator, a motor therefor, a device for starting the motor to either raise or lower the elevator, two relays each connected in a circuit extending to the several floors, a circuit controller at each floor for each of said two relay circuits, one relay controlling the circuit of said device for starting the motor in one direction from whichever floor the call comes, and the other relay controlling the circuit of said device in the other direction, a circuit breaker in each relay circuit on the elevator, and an operating device therefor moved into operative position by operation of either circuit controller.

5. An elevator, a motor therefor, a device for starting the motor to either raise or lower the elevator, two relays each connected in a circuit extending to the several floors, a circuit controller at each floor for each of said two relay circuits, one relay controlling the circuit of said device for starting the motor in one direction from whichever floor the call comes, and the other relay controlling the circuit of said device in the opposite direction, each of said relays when energized operating a circuit breaker in the other relay circuit, a circuit breaker in each relay circuit on the elevator, and an operating device therefor moved into operative position by operation of either circuit controller.

6. An elevator, a motor, a device for starting the motor, two relays each connected in a circuit extending to several floors, a circuit controller at each floor for each of said relay circuits, one relay con-

trolling the circuit of said device for starting the motor in one direction from whichever floor the call comes, and the other relay controlling the circuit of said device in the opposite direction, each of said relays when operated closing a locking circuit through its magnet independent of the circuit controllers at the floor where the elevator is wanted, a circuit breaker in each relay circuit on the elevator, and an operating device therefor moved into operative position by operation of either circuit controller.

7. An elevator, a motor, a device for starting the motor, two relays each connected in a circuit extending to several floors, a circuit controller at each floor for each of said relay circuits, one relay controlling the circuit of said device for starting the motor in one direction from whichever floor the call comes, and the other relay controlling the circuit of said device in the opposite direction, each of said relays operating a circuit breaker in the other relay circuit, and an automatic circuit breaker in the locking circuit operated by the arrival of the elevator at the calling-floor.

8. A well, an elevator, controlling devices for the elevator comprising two manually operated circuit closers on each of several floors, a rod or device at each floor moved by operation of either of said circuit closers into position to operate a circuit controller on the elevator when the latter is moved, and said circuit controller on the elevator.

9. A well, an elevator, controlling devices comprising a circuit controller on the elevator, circuit closers at several floors, a rod at each floor moved into position to operate the circuit controller by operation of either of said circuit closers, said controller operating in both directions.

10. An elevator well, an elevator, a propelling motor on the elevator, the circuits extending to different floors, two circuit closers at each floor, electric circuits and relays on the elevator, and locking circuits for the relays to maintain an operating condition of the proper circuits until the condition is interrupted, and a selected stop device therefor, said device being made operative by operation of either of said circuit closers.

11. A well, an elevator therein, a double circuit breaker on the elevator and comprising a movable body *u* and opposite contacts cooperating therewith, elevator controlling circuits extending to a landing, two keys directly operated at said landing, a rod 100 normally out of the path of said body *u* but projected into such path by operation of either of said keys at such landing.

In testimony whereof, I have signed this specification in the presence of two subscribing witnesses.

C. HERBERT OCUMPAUGH.

Witnesses:
BENJ. R. CATLIN,
C. M. CATLIN.