F. L. SKINNER.

GATE CONTROLLING MECHANISM FOR OPENINGS IN BUILDINGS.

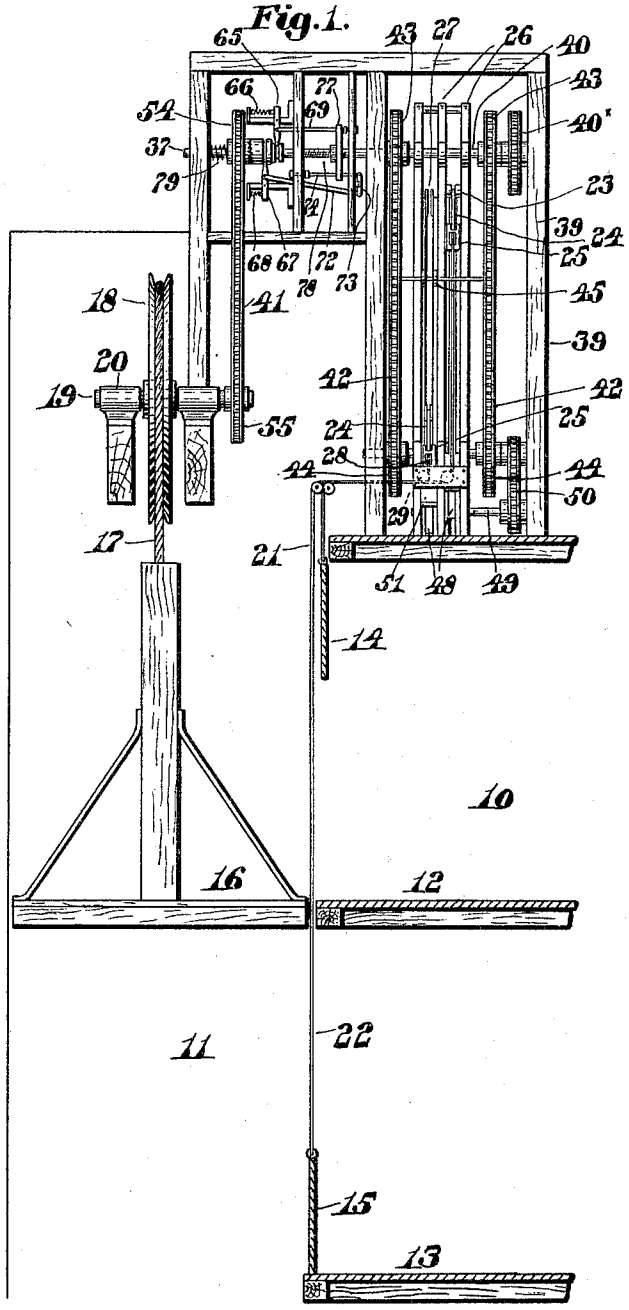
APPLICATION FILED DEC. 12, 1910.

1,006,302.

Patented Oct. 17, 1911.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

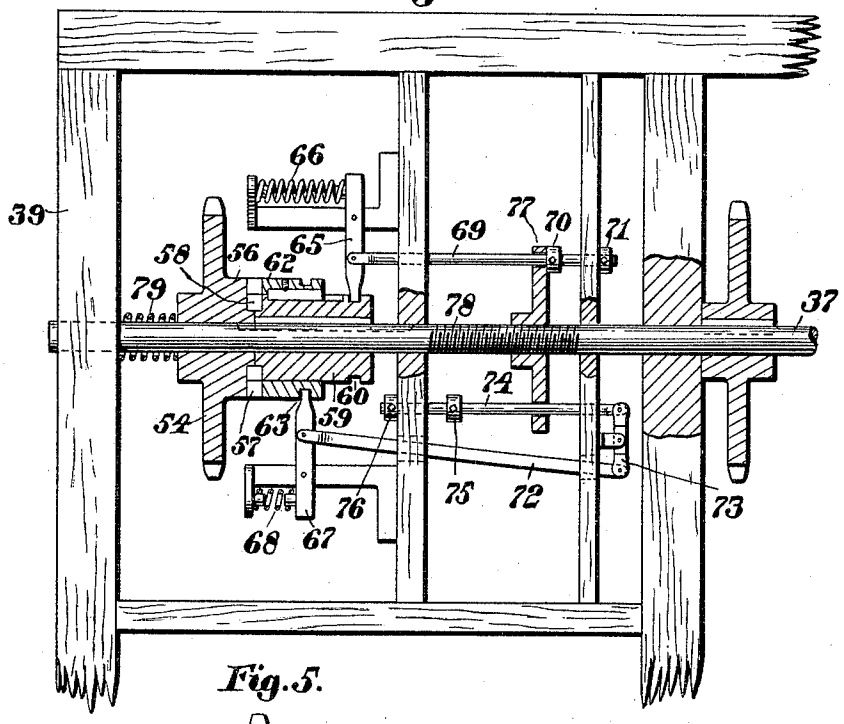


Fig. 5.

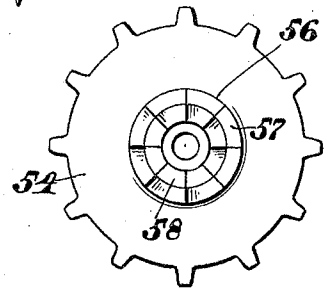


Fig. 6.

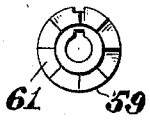


Fig. 7.

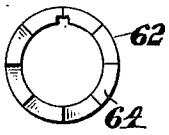


Fig. 3.

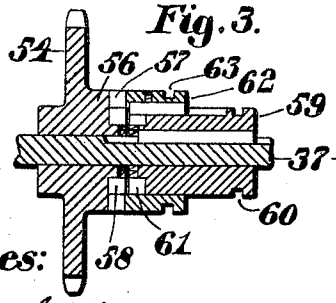
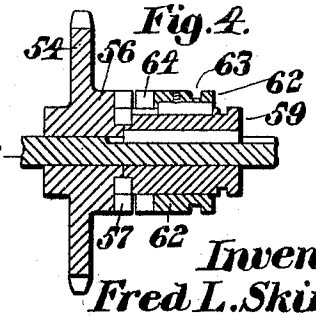


Fig. 4.



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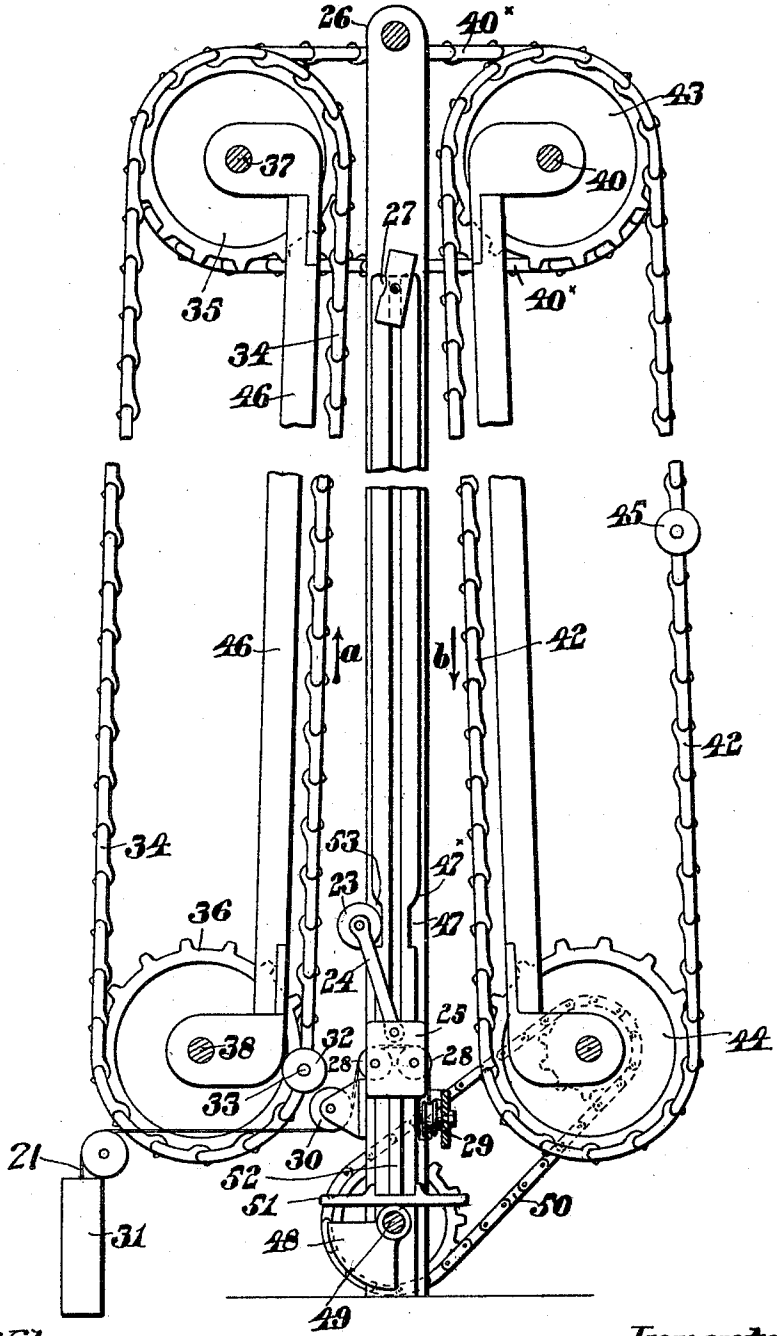
3 SHEETS—SHEET 3.

Fig. 8.



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UNITED STATES PATENT OFFICE.

FRED L. SKINNER, OF MALDEN, MASSACHUSETTS.

GATE-CONTROLLING MECHANISM FOR OPENINGS IN BUILDINGS.

1,006,302. Specification of Letters Patent. **Patented Oct. 17, 1911.**

Application filed December 12, 1910. Serial No. 596,994.

To all whom it may concern:

Be it known that I, FRED L. SKINNER, a citizen of the United States of America, and a resident of Malden, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Gate-Controlling Mechanism for Openings in Buildings, of which the following is a specification.

This invention relates to mechanism for operating and controlling the gates or doors guarding doorways or other openings in buildings or other structures, and is particularly adapted to operate the gates or doors guarding the approaches to an elevator well.

The present invention is an improvement upon the invention filed by me Oct. 18, 1910, and numbered 586,664, and has for its object the provision of means for compensating for stretches in the rope or cable of the elevator lifting mechanism whereby the gate controlling mechanism will be operated always at predetermined times.

It consists in a freely revoluble clutch member driven from the elevator lifting mechanism and other clutch members on the driving shaft of the gate actuating mechanism normally engaged with said revoluble clutch member, but adapted under abnormal conditions to be disengaged therefrom and thereby cause a cessation of the operation of the said gate actuating mechanism.

The invention further consists in providing the freely revoluble clutch member with two sets of oppositely disposed teeth and the driving shaft of the gate actuating mechanism with a slidable clutch member splined thereto and having teeth coacting with one set of teeth on the revoluble clutch member and said slidable clutch member with another slidable clutch member superimposed thereon and splined thereto, having teeth coacting with and normally engaging the other set of teeth on said freely revoluble clutch member, mechanism being also provided actuated by the rotation of the driving shaft for moving either of said slidable clutch members out of engagement with said freely revoluble clutch member to prevent further rotation of said driving shaft under abnormal conditions.

The invention further consists in certain novel features of construction and arrangement of parts which will be readily understood by reference to the description of the drawings and to the claims hereinafter given.

Of the drawings: Figure 1 represents in section a portion of a building provided with mechanism for operating and controlling the elevator gates at the different floors and having applied thereto the controlling mechanism embodying the features of the present invention. Fig. 2 represents an elevation, partially in section, of the controlling mechanism, said figure being drawn to an enlarged scale. Fig. 3 represents a longitudinal section through the clutch mechanism, showing the inner slidable clutch member in disengaged position. Fig. 4 represents a similar section showing the outer slidable clutch member in disengaged position. Fig. 5 represents a face view of the freely revoluble clutch member. Fig. 6 represents an end view of the inner slidable clutch member. Fig. 7 represents an end view of the outer slidable clutch member, and Fig. 8 represents an elevation of one unit of the gate operating mechanism.

In the drawings, 10 represents a building and 11 an elevator well therein, having doorways or openings communicating therewith at the different floors 12 and 13, these openings being protected by means of the vertically moving gates 14 and 15. For convenience, only two openings and gates 14 and 15 are shown in the drawings, but it is obvious that any number of such openings or gates may be used without affecting the principles of the invention.

Vertically movable in the well 11 is an elevator car 16, which may be of the platform type, as shown in Fig. 1, or may be of any other suitable form of construction. This elevator car 16 may be operated by any suitable mechanism, and in the drawings, said elevator car is provided with a hoisting rope or cable 17 passing over a drum 18 secured to and revoluble with a shaft 19 mounted in bearings 20 and located at the top of the elevator well, said bearings 20 being supported in any well-known manner. The gates 14 and 15 are provided with suitable hoisting ropes or cables 21 and 22, these ropes or cables being independent of each other, and are each operatively connected with a con-

trolling mechanism independent of the controlling mechanisms for the other gates. As each controlling mechanism forms a unit, it is only necessary to describe the operation of one unit.

Each unit operating a controlling mechanism is composed of two distinct devices, one an actuating device and the other an actuated device. The actuated device is connected with the gate and is moved at the proper time, as will be hereinafter described, by the actuating device.

As shown in the drawings, the actuated device includes a pair of rollers 23, carried by the upper end of the arm or lever 24, pivoted at its lower end to the movable support or block 25, said block being adapted to slide longitudinally on vertical guide bars 26, each of which is preferably provided at its upper end with pivoted crossbars 27, having concavities or sockets for the reception of the rollers 23, in which said rollers are adapted to be positioned when the gate is in its raised position.

The sliding block 25 is provided with one or more freely revoluble sheaves or wheels 28, over which the gate lifting rope or flexible connection 21 is passed and held in engagement therewith by idler wheels 29 and 30 located on opposite sides of the guide bars 26, and freely revoluble about fixed supports. When the sliding block 25 is moved up on the guide bars, the rope 21, which is fastened at one end to the gate, is carried with it and the gate is lifted. While one end of the rope 21 is secured to the gate 14, its opposite end has secured thereto a weight 31, normally contacting with a fixed member to prevent its upward movement, or, if desired, this opposite end of the rope 21 may be secured to a fixed member. By this construction it is evident that the sliding block 25 is only required to move one-half the travel of the gate 14. This sliding block 25 is moved upwardly on the guide bars 26 by the actuating device, which consists, as herein shown, of the pair of rollers 32 mounted on the shaft or rod 33, connected at its opposite ends to endless carriers, herein shown as link chains 34, which are located at opposite ends of the apparatus or controlling mechanism, so that the shaft 33 extends transversely of said mechanism, as represented in the drawings. The link chains 34 are passed about sprocket wheels 35 and 36, located at the upper and lower ends of the controlling apparatus, and are mounted on shafts 37 and 38, which have bearings in the framework 39 of said apparatus. In the present instance, the lever or arm 24 is shown as carrying the two rollers 23 and each shaft or rod 33 is provided with two rollers 32, which coöperate with the rollers 23, as will be herein described, but to facilitate description, the rollers 23 carried by each lever or arm 24, may be considered as a single roller, and the rollers 32 on the shaft 33 which coöperate with them, may be considered as a single roller.

The actuating shaft 37 of the endless carrier 34 for the roller 32 may be driven in any suitable manner, and is herein represented as driven by a belt or chain 41 from the shaft 19 of the elevator hoisting mechanism.

As shown in Fig. 8 of the drawings, a second endless carrier 42 is located on the opposite side of the vertical guide 26 for the sliding block 25, said carrier 42 being passed about sprocket wheels 43 and 44, and is provided with a roller 45 which coöperates with the roller 23 when the latter is on the opposite side of the guide bar 26. The endless carrier 42 is designed to be driven in unison with the endless carrier 34, and the shaft 40 thereof is connected by a belt or chain $40^{\times}$ with the shaft 37 of the endless carrier 34. The roller 32 of the endless carrier 34 may be designated the gate lifting roller, and the roller 45 of the endless carrier 42 may be designated the gate lowering roller on the upward travel of the elevator, and vice versa on the downward movement of the elevator.

The roller 32 of the endless carrier, on the upward travel of the elevator 16, moves in the direction of the arrow *a*, and as it starts to move upwardly will engage with the roller 23 if the latter roller is moved outwardly into its path, and will force the latter roller ahead of it, the roller 23 thereby lifting the sliding block 25, the rope 21 and the gate 14 attached to the latter. The roller 32 in its upward movement may bear against a guide bar 46, and the roller 23 against the guide bar 26. The roller 23 is thus moved upward until the gate connected with it has been fully opened, and at about the same time as the gate has been fully opened, the roller 23 reaches the top of the guide bar 26, and is forced into the recess or cavity 27, in which it remains as long as the elevator remains at the floor, the gate of which has been raised. For illustration, assume that the raised gate is the gate 14 on the second floor in Fig. 1. Assume also that the elevator car has been again started on its upward travel. In this case, the roller 32 on the endless carrier 34 becomes inactive on the roller 23 and the roller 45 on the endless carrier 42 becomes active and moves dawnwardly in the direction indicated by the arrow *b*, see Fig. 8. The roller 45 passes by the pivoted crossbar or seat 27 for the roller 23, and strikes one end of the same so as to tilt it from a horizontal position into an inclined position. This action shifts the roller 23 and its lever 24 to the other side of the guide bar 26, down which it is moved by the weight of

the gate 14. It is obvious, however, that the downward movement of the roller 23 and of the gate 14 will be governed by the roller 45 of the endless carrier 42, inasmuch as the roller 23 rests on the roller 45 of the carrier 42 as the gate is moved downward.

When a lower gate, as for instance, the gate 15, is closed after the elevator car moving in the well has passed by the floor, the endless carriers 34 and 42 continue in motion, and provision is made for removing the roller 23 connected with the gate 15 from the path of movement of the roller 45 of the endless carrier 42, which is effected by providing the guide bar 26 with the recess 47, into which the roller 23 is moved out of the path of the roller 45 of the endless carrier 42, and allows said endless carrier 42 to continue in motion to operate the units controlling the operation of the gate 14, or such other gates as may be above the gate 15, without effecting any movement of said gate 15 until the elevator car again descends. Inasmuch as the operation of all of the units is the same, we will assume that the elevator car is descending from above the first floor. In this case, the travel of the endless carrier 42 is reversed, and with the apparatus herein shown, the roller 23 is first moved up out of the recess 47 in position to be engaged by the roller 45 of the carrier 44. This movement of the roller 23 from its inoperative position into its operative position is effected as shown by a cam 48 on the shaft 49 journaled in the guidebars 26 and connected by a belt or chain 50 driven from the shaft of one of the sprocket wheels of the endless carrier 42. The cam 48 acts on the crossbar or piece 51 which is provided with a vertical bar 52, on which the sliding block 25 normally rests. When this crossbar or piece 51 is lifted by the rotation of the cam 48, the sliding block 25 is raised, thereby forcing the roller 23 up the inclined wall $47^{\times}$ of the recess 47 into the path of the roller 45 of the carrier 42. The roller 45 now moves in the direction of the arrow *a*, and lifts the roller 23 and its gate until the roller 23 is seated in the recess of the cross piece or seat 27.

If the elevator car 16 stops at the first floor, the endless carriers stop and the gate 15 remains in its elevated position, the roller 23 resting in the seat. If the elevator car continues to descend, as for instance, into the basement of the building, the roller 32 of the carrier 34, moving in the direction of the arrow *b*, strikes the seat 27 and tilts the same into the position shown in Fig. 8, and discharges the roller 23 above and upon the roller 32 so that the descent of the gate is controlled by said roller 32 until the gate has been closed, at which time the cam 48 passes out of contact with the crossbar 51, and allows the slide 25 to descend and the roller 23 to enter the recess 53 in the guide bar 26, in which position it is out of the path of the roller 23, so that the latter can travel by it freely.

When the travel of the elevator car is again reversed so as to move upwardly, the cam 48 forces the roller 23 out of the recess 53 and into a position in the path of the roller 32, when the latter is moved upwardly in the direction indicated by the arrow *a*. The operation above described with relation to the gate 14 and its unit of the controlling mechanism is the same in the case of the other gates and their units.

The apparatus just described is substantially the same and operates in practically the same manner as the apparatus shown and described in my prior application above referred to. It has been found, however, that in practice the hoisting rope 17 of the elevator, owing to excessive weights thereon, is liable to stretch and become elongated, moreover there sometimes occurs considerable slipping on the hoisting drum. As a consequence of this increase in the length of the rope or cable 17, which is liable to increase in length from time to time, and the additional revolutions of the hoisting drum made necessary by the slipping of the rope thereon, the gate controlling apparatus would soon be out of time with the movements of the elevator car. Obviously this would cause the gate at each floor to be operated at the wrong time and not when the elevator car is on a level with the floor or adjacent thereto. This is a serious objection and some provision must be made whereby the operation of the gates will be accurately timed so that each gate will operate at a predetermined time, as, for instance, the gate 14 should operate so that it will be raised when the elevator car 16 reaches the level of the floor 12. This objection is entirely overcome by the present invention, which provides a uniform movement of the gate controlling mechanism under any and all conditions. It consists in providing a clutch mechanism interposed between the elevator lifting or hoisting mechanism and the gate controlling mechanism, whereby, under normal conditions, the two mechanisms operate in unison, but a provision, however, is made so that when the gate controlling mechanisms have completed their cycle of operations, further movement thereof will be prevented during any additional movement of the elevator car 16 in either direction.

Freely revoluble upon the actuating shaft 37 of the gate controlling mechanism is a sprocket wheel 54 driven by the chain 41 from the sprocket wheel 55 secured to the shaft 19 of the elevator hoisting mechanism. This sprocket wheel 54 is provided with a hub 56 having two sets of oppositely dis-

posed clutch teeth 57 and 58 on the end thereof. The said teeth 58 are in an annular path co-axial with the shaft 37, and the teeth 57 are also in an annular path surrounding said teeth 58. The shaft 37 has splined thereto the sliding clutch member 59, having an annular groove 60 in the periphery thereof. This slidable clutch member 59 is provided on its inner end with teeth 61 adapted to coact with the teeth 58 on the hub of the sprocket wheel 54. Superimposed upon the slidable clutch member 59 and splined thereto is another slidable clutch member 62 provided near one end with a peripheral groove 63 and at its opposite end with a plurality of teeth 64 coacting with the teeth 57 in the hub of the sprocket wheel 54. Into the groove 60 extends the end of the pivoted lever 65, the opposite end of which is actuated by a spring 66 to normally retain the slidable block 59 in position for the teeth 61 thereon to engage with the teeth 58 on the sprocket wheel 54. Similarly into the groove 63 of the slidable block 62 extends the end of the pivoted lever 67, the opposite end of which is actuated by a spring 68 to normally retain said slidable clutch member 62 in position for its teeth 64 to engage with the teeth 57 of the sprocket wheel 54. Pivotally connected to the lever 65 is a slidable rod 69, having adjustably mounted thereon the stop members 70 and 71. Pivotally connected to the lever 67 is a connecting link 72, the opposite end of which is pivotally connected to a rocker member 73, the opposite end of which has pivotally connected thereto a rod 74 slidable in suitable bearings in the framework 39 and having mounted thereon the adjustable members 75 and 76. The rods 69 and 74 extend through openings in the reciprocating member 77, the hub of which is threaded to the threaded portion 78 of the actuating shaft 37. This threaded portion 78 of the actuating shaft 37 is so constructed that during the movement of the elevator car from the bottom to the top of its well, the member 77 will be moved longitudinally of the shaft 37 in one direction, and when the elevator car descends, this member 77 will be moved in the opposite direction on said shaft.

The adjustable members 71 and 76 are so positioned on the rods 69 and 74 as to limit the movement of the slidable blocks 59 and 62 toward the sprocket wheel 54. The adjustable members 70 and 75 on said rods are so adjusted on the rods 69 and 74 that when the gate controlling mechanisms have completed their operations for the movement of all of the gates during the travel of the elevator 16 in its well in either direction, one of them will be engaged by the reciprocating member 77 and cause the one of the slidable blocks 59 or 62 being driven to be moved longitudinally of the shaft 37, so that its teeth will become disengaged from the coacting teeth upon the sprocket wheel 54. This will prevent further rotations of the shaft 37, although the elevator car is free to move further in either direction without effecting any movement of the gate controlling mechanism. This is accomplished by permitting the sprocket wheel 54 to revolve freely on the shaft 37, the teeth of the clutch members remaining in engagemnt riding over each other against the tension of the spring 79 interposed between said sprocket wheel and the frame 39. Normally both slidable clutch members 59 and 62 are engaged with the teeth 57 and 58 upon the sprocket wheel 54 so that the movement to the actuating shaft 37 may be imparted in either direction by the rotation of the sprocket wheel 54.

It is evident that, with the use of this compensating device, the gate controlling mechanism will always work uniformly throughout the ascending or descending travel of the elevator car, even when such travel of the elevator may be made under varying conditions, and that the gates will always, where this device is used, operate at predetermined times.

It is believed that the operation and many advantages of the invention will be thoroughly understood from the foregoing.

Having thus described my invention, I claim:

1. The combination of a movable gate; an actuating device therefor including a driving shaft; a revoluble driving member on said shaft; a car lifting mechanism coacting with said revoluble driving member under normal conditions for driving said shaft; and means for disengaging said car lifting mechanism from said revoluble member at predetermined points in the movement of said car lifting mechanism.

2. The combination of a movable gate; an actuating device therefor including a driving shaft; a revoluble driving member on said shaft; a car lifting mechanism coacting with said revoluble driving member under normal conditions for driving said shaft in either direction; and means for disengaging said car lifting mechanism from said revoluble member at predetermined points in the movement of said car lifting mechanism.

3. The combination of a movable gate; an actuating device therefor including a driving shaft; a revoluble driving member on said shaft provided with two sets of oppositely disposed clutch teeth; slidable clutch members on said shaft and revoluble therewith, having oppositely disposed teeth normally engaging the teeth on said revoluble member; and means actuated by the rotation of said shaft for disengaging either of said slidable clutch members.

4. The combination of a movable gate; an actuating device therefor including a driving shaft; a revoluble driving member on said shaft provided with two sets of oppositely disposed clutch teeth; slidable clutch members on said shaft and revoluble therewith having oppositely disposed teeth normally engaging the teeth on said revoluble member; mechanism for normally retaining said clutch members in engagement and adapted to operate to disengage either of them; and means including a reciprocating member actuated by the rotation of said shaft adapted to operate said mechanism under abnormal conditions and disengage either of said clutch members.

5. The combination of a movable gate; an actuating device therefor including a driving shaft; an elevator lifting mechanism; a clutch mechanism on said shaft driven by said lifting mechanism; means movable longitudinally of said shaft by the rotation of said shaft; and mechanism actuated by said movable means for separating the members of said clutch mechanism and causing cessation of rotation of said shaft.

6. The combination of a movable gate; an actuating device therefor including a driving shaft; an elevator lifting mechanism; a clutch mechanism on said shaft driven by said lifting mechanism, one of the members of which is splined to and slidable on said shaft; a member movable longitudinally of said shaft by the rotation of said shaft; and a device for operating said sliding clutch member to disconnect it from the driving clutch member provided with shouldered members in the path of movement of said longitudinally movable member.

7. The combination of a movable gate; an actuating device therefor, including a driving shaft; an elevator lifting mechanism; a clutch member revoluble about said shaft by said lifting mechanism, and having two sets of oppositely disposed teeth thereon; a second clutch member splined to and movable longitudinally of said shaft and provided with a plurality of teeth adapted to coöperate with one set of teeth on said revoluble member; a third clutch member splined to and movable on said second clutch member and provided with teeth adapted to coöperate with the other set of teeth on said revoluble clutch member; independent devices for moving said slidable clutch members out of engagement with said revoluble clutch member; and a reciprocating member on said driving shaft adapted under abnormal conditions to operate one of said devices at the end of its movement.

8. The combination of a movable gate; an actuating device therefor including a driving shaft; an elevator lifting mechanism; a clutch member revoluble about said shaft by said lifting mechanism; and having two sets of oppositely disposed teeth thereon; a second clutch member splined to and movable longitudinally of said shaft and provided with a plurality of teeth adapted to coöperate with one set of teeth on said revoluble member; a third clutch member splined to and movable on said second clutch member and provided with teeth adapted to coöperate with the other set of teeth on said revoluble clutch member; independent devices for moving said slidable clutch members out of engagement with said revoluble clutch member; a reciprocating member on said driving shaft adapted under abnormal conditions to operate one of said devices at the end of its movement; and springs for returning said slidable clutch members into engagement with said revoluble clutch member.

9. The combination of a movable gate; an actuating device therefor including a driving shaft; an elevator lifting mechanism; a clutch member revoluble about said shaft by said lifting mechanism and having two sets of oppositely disposed teeth thereon; two clutch members slidable lengthwise of said shaft and each having teeth normally co-acting with one set of teeth on said revoluble member to drive said shaft in either direction; and means operable by said shaft for disengaging one of said clutch members under abnormal conditions to prevent further rotation of said shaft.

10. The combination of a movable gate, an actuating device therefor including a driving shaft; an elevator lifting mechanism; a clutch member revoluble about said shaft by said lifting mechanism and having two sets of oppositely disposed teeth thereon; two annular clutch members revoluble with and slidable longitudinally of said shaft and each having teeth normally coacting with the teeth on said revoluble clutch member to drive the shaft in either direction; a pivoted member for moving each slidable clutch member; a spring co-acting therewith for retaining said clutch member in operative position; a movable rod pivotally connected to each pivoted clutch operating member; a shouldered member on each rod; and a reciprocating member on said shaft adapted to engage one of said shouldered members at each end of its reciprocating movement.

11. The combination of a movable gate, an actuating device therefor including a driving shaft; an elevator lifting mechanism; a clutch member revoluble about said shaft by said lifting mechanism and having two sets of oppositely disposed teeth thereon; a spring interposed between said revoluble clutch member and a bearing for said shaft; two annular clutch members revoluble with and slidable longitudinally of

said shaft and each having teeth normally co-acting with the teeth on said revoluble clutch member to drive the shaft in either direction; a pivoted member for moving each slidable clutch member; a spring co-acting therewith for retaining said clutch member in operative position; a movable rod pivotally connected to each pivoted clutch operating member; a shouldered member on each rod; and a reciprocating member on said shaft adapted to engage one of said shouldered members at each end of its reciprocating movement.

12. The combination of a movable gate, an actuating device therefor including a driving shaft provided with a spiral thread; an elevator car; a lifting drum therefor; a wheel revoluble with said drum; a revoluble clutch member on said driving shaft driven by said wheel; a member movable longitudinally of said shaft by said spiral thread; a clutch member splined to said shaft and slidable thereon and adapted to coöperate with the other clutch member; and means operable by the movable member actuated by said thread for disconnecting said clutch member when the elevator car is at a predetermined point.

13. The combination of a vertically movable gate; a lifting mechanism therefor including a driving shaft; a revoluble driving member on said shaft; a car lifting mechanism normally coacting with and rotating said revoluble member; and means operable at predetermined points in the movement of the car for disconnecting said revoluble member from said car lifting mechanism and preventing further movement thereof during the continued movement of said car lifting mechanism.

Signed by me at 4 Post Office Sq., Boston, Mass., this 9th day of December, 1910.

FRED L. SKINNER.

Witnesses:
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MARY C. SMITH.