No. 826,559. PATENTED JULY 24, 1906.

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STOP DEVICE FOR ELEVATORS.

APPLICATION FILED MAY 18, 1905.

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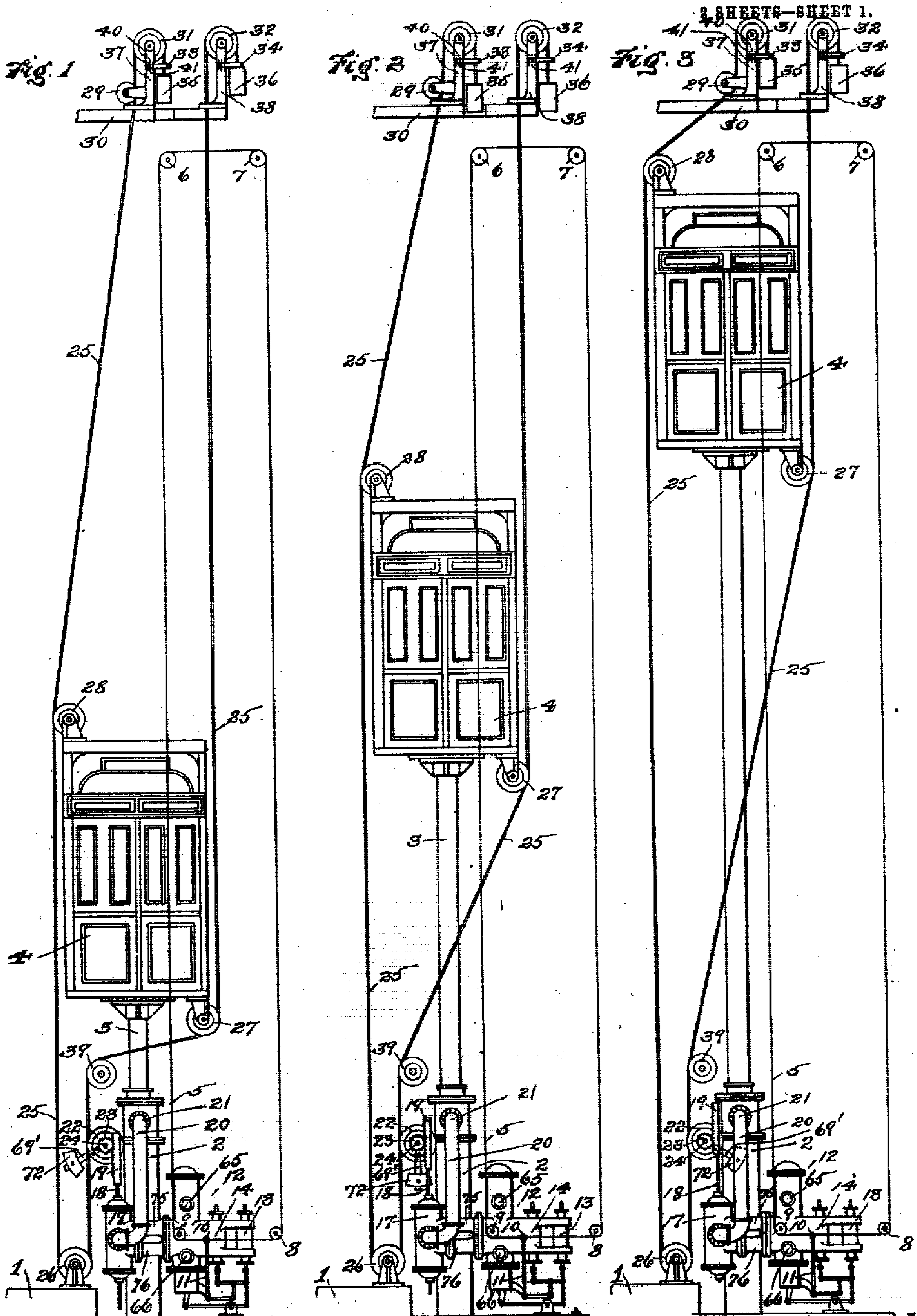

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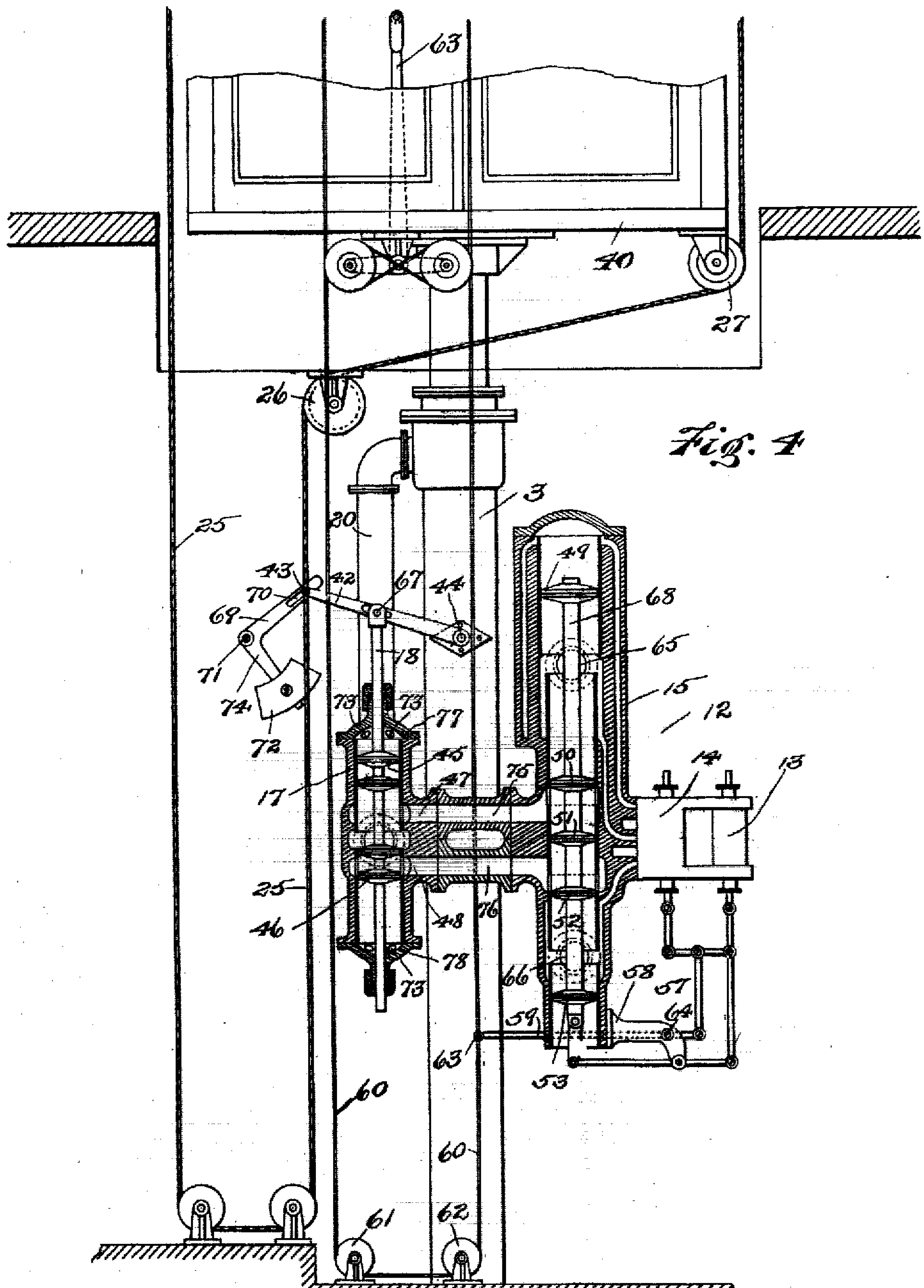

Fig: 4

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UNITED STATES PATENT OFFICE.

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STOP DEVICE FOR ELEVATORS.

No. 826,559. Specification of Letters Patent. Patented July 24, 1906.

Application filed May 18, 1905. Serial No. 260,965.

To all whom it may concern:

Be it known that I, FLOYD C. FURLOW, a citizen of the United States, residing at Montclair, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Stop Devices for Elevators, of which the following is a specification.

My invention relates to means for automatically stopping an elevator-car at predetermined points in its travel.

The especial object of my invention is the provision of simple and positive means for automatically and gradually stopping an elevator-car at the limits of its travel.

A further object of my invention is to provide means for stalling the car at a predetermined point upon derangement of the means for operating the stop mechanism.

Other objects will appear hereinafter.

To these ends my invention consists of the construction and arrangement of parts, as hereinafter disclosed, the novel combination of elements being pointed out in the claims.

Referring to the drawings, Figure 1 represents in elevation my invention combined with a plunger-elevator system, the car being shown at its lower limit of travel. Fig. 2 shows the same parts, but with the car at the middle of its travel. Fig. 3 is a view similar to Fig. 1, but represents the relation of parts when the car is at its upper limit of travel; and Fig. 4 is a detached detail elevational view of one form of operating-valve mechanism which may be used, the valve mechanism being shown in detail.

1 designates a basement-floor, through which and into the ground is sunk the plunger casing or cylinder 2.

3 designates the plunger, to the upper end of which is secured the car 4. Through the car passes the standing-rope 5, which is suitably supported by the fixed direction or guide pulleys 6, 7, 8, and 9. This rope is secured at 10 to the operating-lever 11 of the controlling-valve mechanism 12, (shown in detail in Fig. 4,) so that the operator in the car may move this lever 11 to one side or the other to start and stop the car.

The valve mechanism 12 comprises a throttling-valve 13, a pilot-valve 14, and a main, change, or reversing valve 15. The reversing-valve 15 is shown connected by pipes 75 and 76 to the automatic stop mechanism or stop-motion valve 17, and the latter is connected by the pipe 20 to the plunger-cylinder 2 at 21.

The automatic stop-motion valve is so constructed that fluid-pressure may be exerted through the same to the cylinder 2 after the elevator-car has been stopped at its lower limit of travel to again start the car, or when the car is at its upper limit of travel the fluid in the cylinder 2 may be exhausted through said stop-motion valve and main valve to allow the car to descend.

To the upper end of the valve-stem 18 of the stop-motion valve 17 is rigidly connected the rack-bar 19, which is arranged to mesh with the pinion 23. This pinion 23 is securely fastened to the drum, and both are mounted to rotate on the fixed bearing 24. The function of this drum is to actuate the stop-motion valve 17 through the pinion 23, rack 19, and valve-stem 18, and this is accomplished by winding the automatically-operated rope or cable 25 one or more times about said drum and providing means for moving said rope to rotate the drum at the proper time.

The rope 25 leads from the drum 22 downwardly to the sheave 26, mounted on bearings in a standard fixed at the bottom of the elevator-well. The rope then leads upwardly, making contact with the guide or deflection pulley 28, journaled on a support shown fixed at the upper left-hand portion of the car 4. The rope continues upwardly to guide-pulley 29, journaled on the standard 37, fixed to the beam structure 30 at the top of the elevator-well.

31 designates a sheave journaled on the upper portion of the standard 37 and over which the rope 25 passes to the weight 35. In the path of travel of the weight 35 is an adjustable stop 33, fixed to the standard 37, to limit the upward movement of said weight. Series of holes 40 and 41 are shown above and below the stop 34, so that the stop may be secured at different elevations. Any other adjusting means may be used, however.

From the drum 22 the rope 25 leads upwardly over the guide-pulley 39, journaled on a fixed support, thence to the deflecting-pulley 27, journaled on a support fixed to the lower right-hand portion of the car, and continues from the pulley 27 to the top of the elevator-well, where it passes around the sheave 32, mounted on the upper portion of the standard 38, fixed to the beam structure 30, and has its end connected to the weight 36. In the same manner that a stop 33 is provided for the weight 35 a stop 34, fixed to the standard 38, is also provided in the path of travel of the weight 36 to limit its upward movement. It is therefore seen that the rope 25 is a single rope, having its ends connected to the weights 35 and 36, respectively. Normally, as shown in Fig. 2, these weights serve to keep the rope taut throughout its entire length, and thus constitute take-up mechanism for the rope.

The operation of the invention will now be described. Assuming the car in its central position, as shown in Fig. 2, let the hand rope 5 be actuated to operate the reversing-valve to cause the car to descend. The weights 35 and 36 will be in their lowermost positions; but as the car lowers the pulley 27 on the car gradually deflects the rope 25 against the pulley 39 as a fixed point, the weight 35 counterbalancing the weight 36. The weight 36 rises until it strikes against the stop 34. In the meantime the weight 35 has lowered somewhat because of the increased angle in the rope deflection at the pulley 28. After the weight 36 has come against the stop 34 a pull will be exerted against the same along the rope 25 to the drum 22, revolving the same, and thereby actuating the stop-motion valve to gradually close the exhaust-port, and therefore stop the car. The supply-port being left open in the stop-motion valve, the main valve may be operated to cause the car to ascend. As it does so the stop-motion valve is automatically brought back to central position by means of the weight 72, as indicated by the central position of the rack-bar 19 in Fig. 2. As the car approaches the upper limit of its travel the left-hand portion of the rope 25 is deflected, thus bringing the weight 35 up against the stop 33, as shown in Fig. 3, after which the drum 22 is revolved in a direction reverse to that in which it was previously revolved, and the stop-motion valve is moved upwardly to the position indicated in Fig. 3 by the position of the rack-bar 19. This closes the supply-port, but leaves open the exhaust-port, so the car can descend again when desired. As the car is lowered the stop-motion valve is brought back to central position by means of the weight 72, so that the car may be caused to be elevated and lowered at intermediate points without having to travel to one of the ends of its run. In Figs. 1, 2, and 3 I have shown this weight rigidly connected to the drum 22 by means of the arm 69′. In Fig. 4 I have shown a bell-crank lever pivoted at 71 and the weight 72 secured to the arm 74. The other arm 69 has a slot 70, in which moves a pin projecting from lever 42 at 43.

I preferably wind the rope 25 several times around the drum 22 and securely fasten the central part of such wound portion to the drum, so that if the rope should break the car would be stalled at one of its limits of travel. For instance, if the rope should break between the drum 22 and the weight 36 and the car were in the position shown in Fig. 1, the car would be stalled, for as soon as the weight 36 is cut off the weight 35 acts to revolve the drum 22 in an anticlockwise direction to cause the stop-motion-valve supply port to be closed. If the left-hand portion of the rope 25 breaks, the weight 36 acts to revolve the drum 22 in a clockwise direction, and thereby operates the stop-motion valve to close the exhaust-port, and the car could not be lowered. It is therefore seen that the stop-motion valve is under continual test, and a breaking of the rope or a severance of a weight from its connection with the rope will stall the car, thus notifying the operator of such fact. Furthermore, it is imperative that the rope and connections must be repaired or replaced before the car can be operated again, thus insuring that the car will not be run without the safety limit-stop device.

In place of using a drum 22 a lever 42, secured to the rope 25 at 43, as shown in Fig. 4, may be used. This lever is pivoted at 44 to the cylinder 3 or other suitable support and has a pivotal connection at 67 with the valve-stem 18. Rigidly connected with the stem 18 are the valves 45 and 46, controlling communication between the cylinder 3 and the supply-port 47 and exhaust-port 48, respectively. The stuffing-boxes for the stem 18 are supported by the caps or plates 77 and 78, having holes 73 therein. Spiders may be substituted for plates, however.

12 designates the main-valve mechanism, comprising a main valve or reversing-valve and a pilot-valve 14 and throttling-valve 13 for controlling the same. By means of the usual operating-lever 63 in the car the rope 60, running around the sheaves 61 and 62, may be moved to actuate the lever 59, and thereby operate the pilot-valve 14. This lever 59 is secured to the rope 60 at 63 and is pivoted at 64 to the bracket 58. 57 designates the links and levers for connecting the pilot-valve mechanism with main-valve stem 68. Rigidly connected with the main-valve stem are the motor-piston 49, balancing-pistons 51 and 53, and valves 50 and 52.

65 and 66 are the main supply and exhaust ports and are arranged to communicate with the stop-motion-valve supply-port 47 and exhaust-port 48 through the pipes 75 and 76, respectively.

The pilot-valve mechanism is similar to

that shown in the patent to Cole, No. 700,740, May 27, 1902, for hydraulic valve mechanism.

I have shown in Fig. 4 the details of a main valve merely to show means for controlling the normal operation of the car between the upper and lower limits and how the car can be started after having been stopped by the automatic stop-motion valve. In Fig. 4 the car is shown in its lowermost position and the operating-lever 63 and the main valve in their central positions. The exhaust-port of the stop-motion valve is shown closed; but the supply-port is open, so that upon moving the lever 63 in the proper direction the main valve will be moved downwardly to open communication between the supply-port 65 and the cylinder 3 through the stop-motion-valve casing and the pipe 20.

Although my invention is shown applied to a hydraulic-elevator system, I desire it to be understood that it may be used in connection with other systems and with moving bodies other than elevator-cars. For instance, the automatic stop-motion valve shown and described could be replaced by an automatic electric controlling device if an electric-elevator system were employed, or a steam-valve could be operated by the stop-motion rope. It is obvious that many changes in the details of the construction shown and described could be made by persons skilled in the art without departing from the principle of the invention set forth and claimed herein.

What I claim, and desire to secure by Letters Patent, is—

1. The combination with an elevator-car and stop mechanism therefor, of a rope connected to said stop mechanism, means for causing a deflection of said rope to actuate said stop mechanism, and separate means connected to the ends of said rope for taking up the same.

2. The combination with an elevator-car and stop mechanism therefor, of a rope connected to actuate said stop mechanism, means unattached to the rope for causing a gradual deflection of the same to effect a gradual stopping of the car, and separate means connected to the ends of said rope for keeping the same taut.

3. The combination with an elevator-car and a stop mechanism therefor, of a rope connected to said stop mechanism, means carried by the car for causing a gradual deflection of said rope as the car approaches the end of its run, and separate means independent of the car and connected to the ends of said rope for placing said rope in constant tension.

4. The combination with a hydraulic-elevator car and a stop mechanism therefor, of a rope connected to said stop mechanism, separate take-up devices connected to the ends of said rope, and means unattached to the rope for causing a deflection of same to actuate the stop mechanism.

5. The combination with a car, of stop mechanism therefor, flexible means for actuating said stop mechanism, separate take-up means connected to the ends of said flexible means, and means for causing a deflection of said flexible means to effect the operation of said stop mechanism.

6. The combination with an elevator-car, of a motor for the same, a stop-controlling device for said motor, a rope connected to actuate said stop-controlling device, independent means connected to the ends of said rope for exerting a pull on said rope, and means for varying said pull to effect the operation of said stop-controlling device.

7. The combination with an elevator-car, of a motor therefor, an automatic stop mechanism, a rope connected to said stop mechanism, separate devices connected to the ends of said rope for normally exerting a predetermined pull throughout the length of said rope, and means for varying said pull in different portions of said rope to automatically effect a positive actuation of said stop mechanism.

8. The combination with an elevator-car, of means for moving and controlling same, a stop mechanism, means for actuating said stop mechanism, a rope connected to said actuating means, means separately connected to the ends of said rope for exerting substantially equal tensions in said rope, and means for varying the tension in the rope leading to and from the connection to said actuating means to effect the operation of said stop mechanism.

9. The combination with an elevator-car, of a motor for moving the car, a controlling mechanism for the motor, an automatic stop device, a rope connected to the said automatic stop device, separate means connected to the ends of said rope for placing the portions of the rope leading to and from its connection with said stop device in substantially equal tension, and means for deflecting said rope to vary said tension to effect the actuation of said stop device to stop the car at the ends of its run.

10. The combination with an elevator-car, of means for moving the same, controlling mechanism for said moving means, a stop device, a rope connected thereto, a separate weight connected to each end of said rope, means for deflecting said rope, and means for limiting the movements of said weights to effect the actuation of said stop device upon the deflection of said rope at or near the ends of the car's travel.

11. The combination with an elevator-car, of means for moving and controlling same, stop mechanism, a rope connected to actuate said stop mechanism, an independent weight connected to each end of said rope for keep-

ing the same taut, stops for limiting the upward movement of said weights, and means for deflecting said rope and increasing the tension of a portion thereof against one of said stops to effect the actuation of said stop mechanism.

12. The combination with an elevator-car, of means for moving and controlling same, a stop mechanism, a rope connected to said stop mechanism, separate weights connected to the ends of said rope, limit-stops for said weights, and means for deflecting the rope to cause the actuation of said stop mechanism to stop the car at predetermined points in its travel.

13. The combination with an elevator-car, of means for moving and controlling same, a stop mechanism, means for actuating said stop mechanism, a rope connected to said actuating means, a weight suspended at each end of said rope, limit-stops for the weights, and means carried by the car for deflecting said rope to cause a gradual and automatic stopping of the car at or near its limits of travel.

14. The combination with an elevator-car, of a hydraulic motor for the same, means for controlling said motor from the car, an automatic stop device, a rope connected thereto, weights connected to the ends of said rope, limit-stops for said weights, and means carried by the car for deflecting said rope to automatically move one of said weights against its stop and thereafter gradually actuate said stop device to stop the car at a predetermined point.

In witness whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FLOYD C. FURLOW.

Witnesses:
W. H. Brady,
J. H. Van Alstyne.