No. 826,577. PATENTED JULY 24, 1906.

K. E. O. JANSSON.

AUTOMATIC STOP MOTION APPARATUS.

APPLICATION FILED MAY 16, 1905.

3 SHEETS—SHEET 1.

Fig. 1.

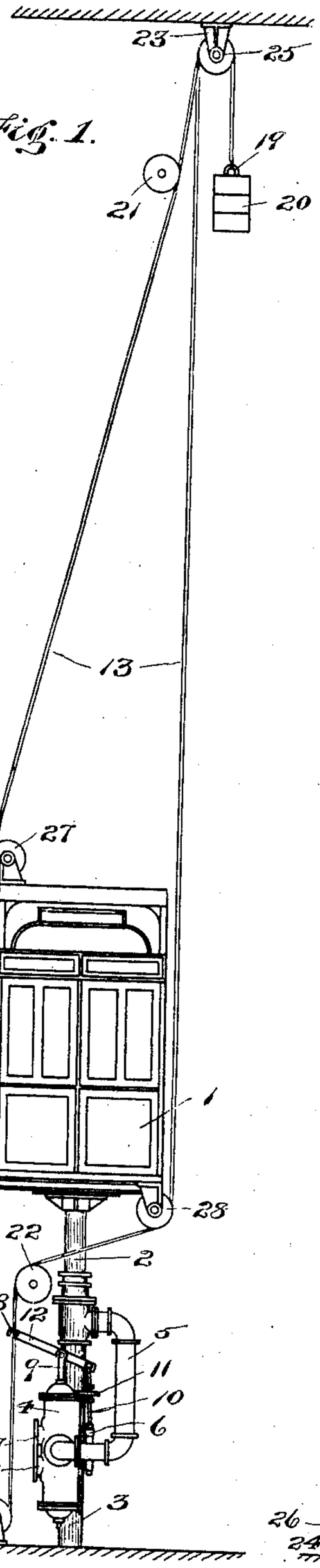


Fig. 2.

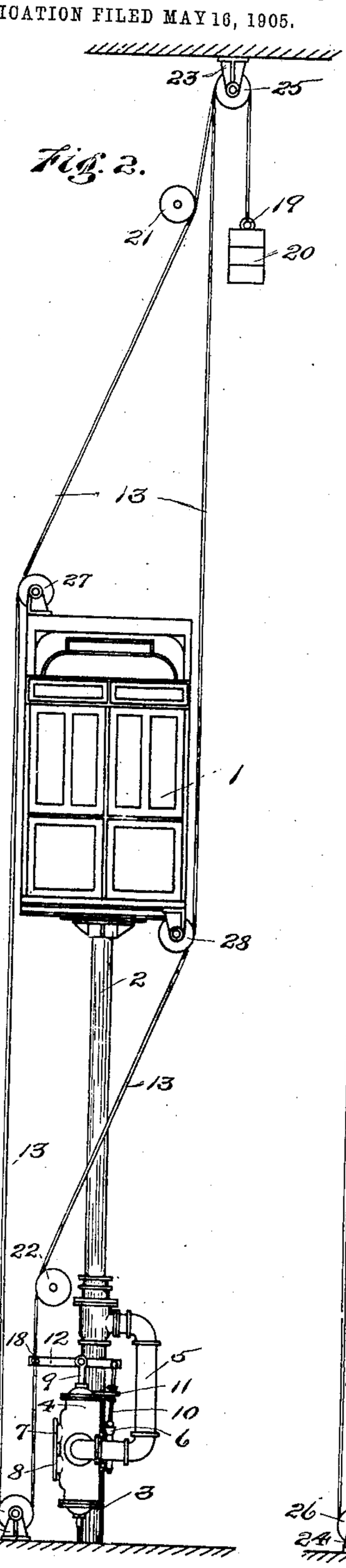
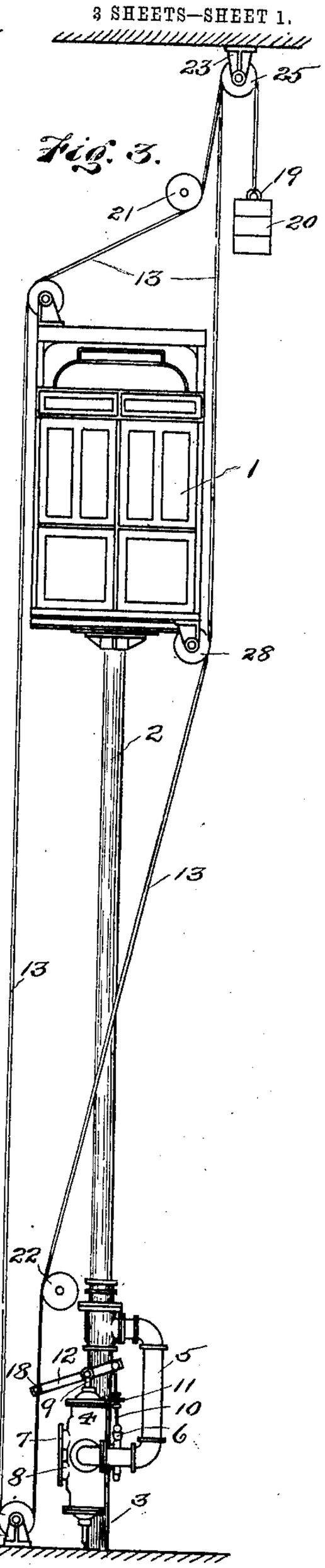


Fig. 3.



WITNESSES

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3 SHEETS—SHEET 2.

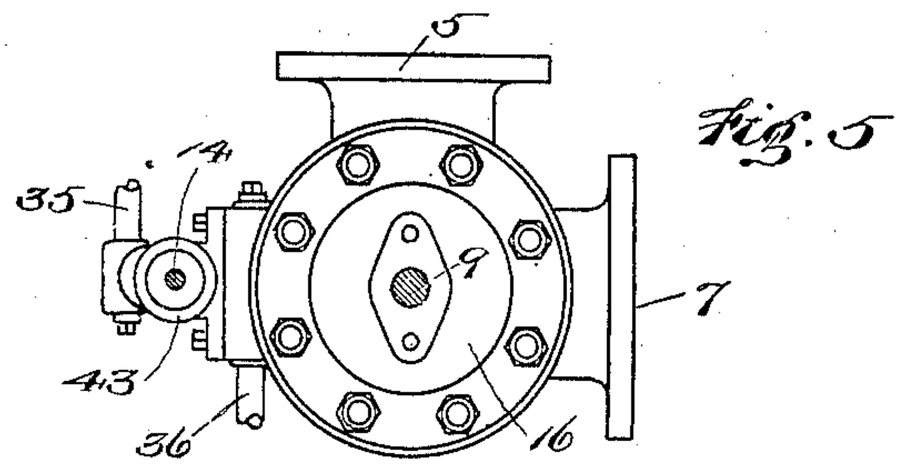

Fig. 5

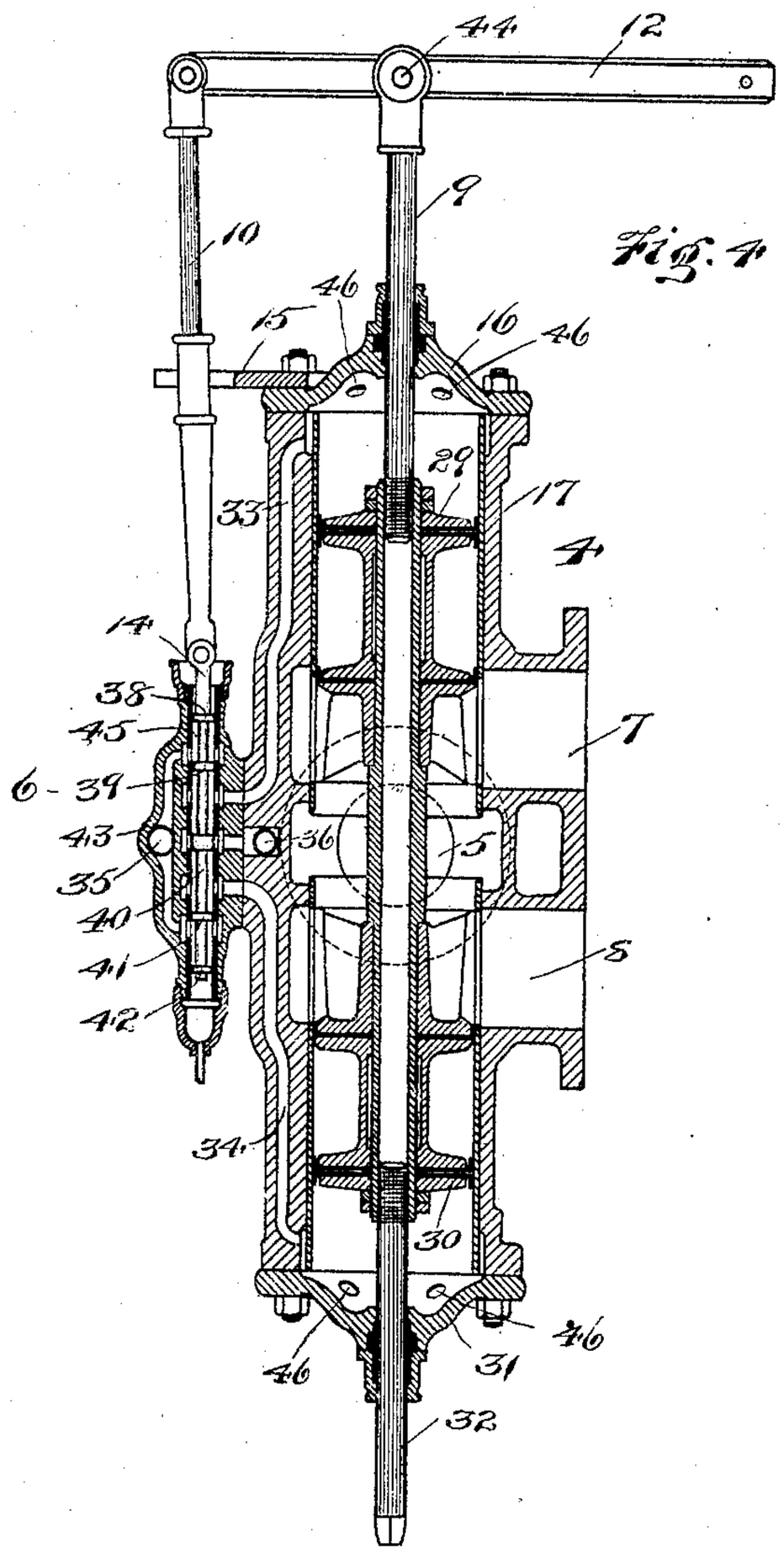

Fig. 4

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3 SHEETS—SHEET 3.

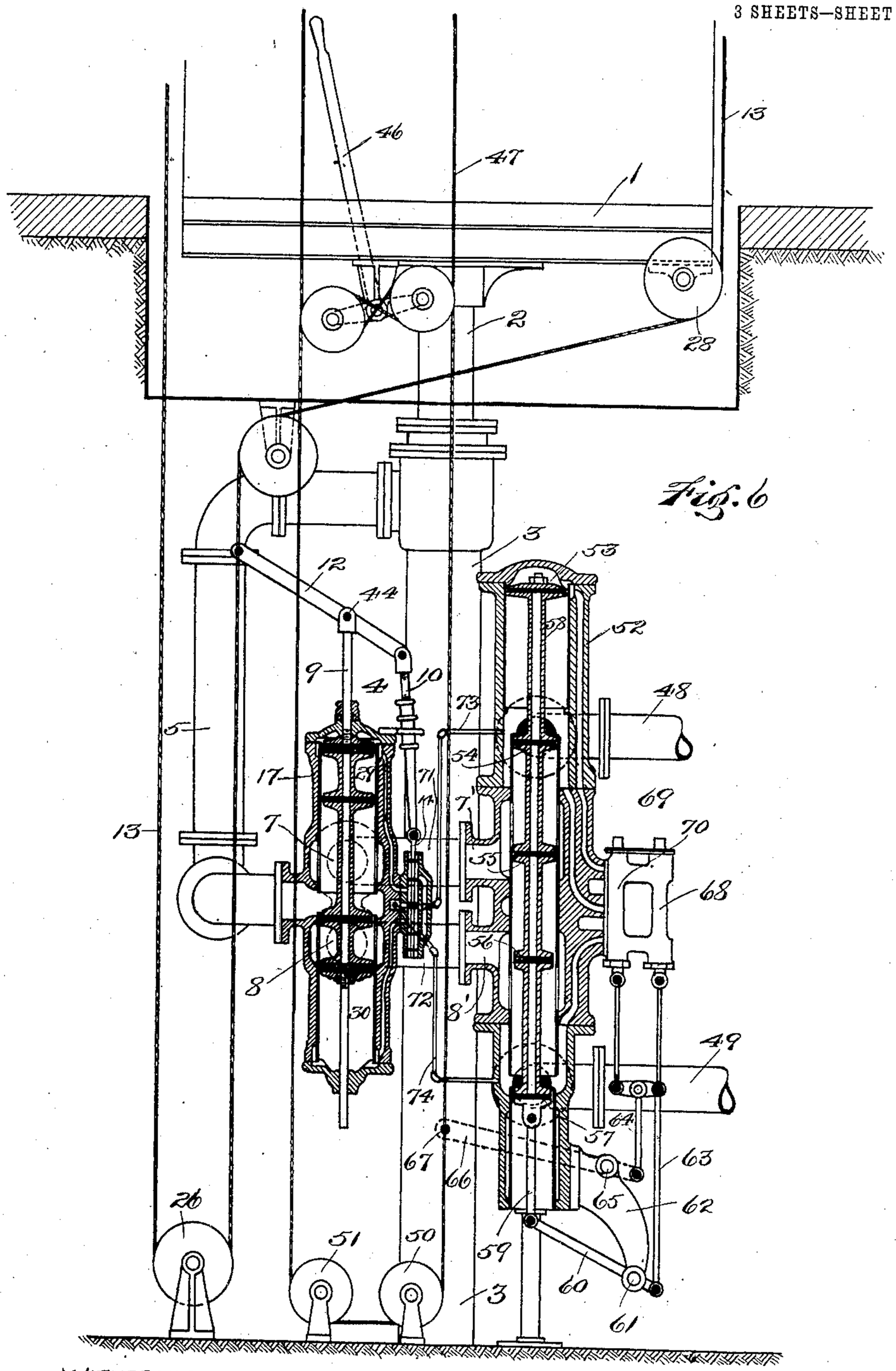

Fig. 6

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AUTOMATIC STOP-MOTION APPARATUS.

No. 826,577. Specification of Letters Patent. Patented July 24, 1906.

Application filed May 16, 1905. Serial No. 260,631.

To all whom it may concern:

Be it known that I, KARL E. OSSIAN JANSSON, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Improvement in Automatic Stop-Motion Apparatus, of which the following is a specification.

My invention relates to means for automatically stopping a car at a predetermined point in its travel.

The object of my invention is to provide an improved, simple, and positive means for automatically operating a stop-motion valve of an elevator system to bring the car to a gradual stop at predetermined points in the travel of the car.

A further object of my invention is the provision of means for stalling the car if the stop-motion apparatus becomes deranged.

Other objects will appear hereinafter, the novel combinations of elements being set forth in the claims.

Referring to the drawings, Figures 1 to 3 represent the relative position of parts when the car is at its lower limit of travel at the middle of its path of travel and at its upper limit of travel, respectively. Fig. 4 is a sectional view of the stop-motion valve in elevation, taken from the opposite side to that shown in Fig. 2. Fig. 5 is an end view of said stop-motion valve and the pilot-valve connected thereto, and Fig. 6 is a sectional elevation of the main-valve mechanism as well as the stop-motion-valve mechanism, and shows how the car can be started after having been stopped by the automatic operation of the stop-motion valve.

In Figs. 1, 2, and 3, 1 designates the elevator-car, which is supported by the plunger 2. This plunger moves vertically in the plunger casing or cylinder 3 and is controlled in its movements by the valve mechanisms illustrated in detail in Fig. 6.

In Figs 1, 2, and 3 I have shown in elevation a stop-motion valve 4 and a pilot-valve 6 for controlling the same. These valves are illustrated in detail in Figs. 4 and 6. 7 designates the supply-port, and 8 the exhaust-port, while 5 is the pipe connecting the stop-motion valve 4 from its central portion to the upper end of the plunger-casing 3. Pivoted to the outer end of the valve-stem 9 is a lever 12, pivotally connected at one end to link 10 and at its other end to the standing rope or cable 13. The link 10 is pivotally connected to the outer end of the pilot-valve stem 14 (see Fig. 4) and is guided in its to-and-fro movements by the slotted guide-plate 15, which is shown bolted to the head 16 of the valve-chest 17 of the stop-motion valve 4. Arranged in the elevator-well so as to be continuously deflected during the movement of the car is the endless rope 13. This rope is for the purpose of operating the pilot-valve 6, and thereby control the operation of the stop-valve 4, to stop the car at the upper and lower limits of its travel. In order to accomplish this purpose, the rope is passed over sheaves, both stationary and movable, and connected at the point 18 to the operating-lever 12 and at the ring 19 to the adjustable weight 20 at the top of the hatchway or elevator-well. At the extreme top and at the extreme bottom are journaled the sheaves 25 and 26 on the fixed standards 23 and 24, respectively. Intermediate these sheaves 25 and 26 are the guide-pulleys 21 and 22, journaled in fixed bearings. The pulley 22 and sheave 24 are arranged in the same plane with all the other pulleys and in such position that the portion of the rope 13 between the pulley 22 and sheave 26 shall always be substantially vertical and at right angles to the lever 12 when the stop-motion valve is in its central position. The pulley 21 is mounted a short distance to the left of a vertical line drawn through the axis of the sheave 25. Rotatably mounted at the upper left-hand and lower right-hand portions of the car are the deflection-pulleys 27 and 28, which as the car moves constantly tend to change the position of said rope relatively to the stop-motion-valve mechanism. It will be seen that since the ends of the rope 13 are connected to the weight 20 it is practically an endless rope and that as the car approaches the lower limit of its travel the lower portion of said rope is moved in an anticlockwise direction. This can be seen upon an inspection of Figs. 1 and 2, for on the movement of the car from its position in Fig. 2 to its position in Fig. 1 the pulley 27 gradually decreases the angular deflection of the left-hand portion of the rope 13 and increases the angular deflection of the right-hand portion thereof. The length of

the rope on the left-hand side between the ring 19 and the sheave 26 is shortened and the length on the right-hand side correspondingly increased. The weight 20 is shown a little lower in Fig. 2 than in Fig. 1, since the rope considered as double is lengthened out when the car is in an intermediate position. The weight 20 not only keeps the rope taut at all times, thus acting as a take-up device, but also coacts with the deflection-pulleys to cause the actuation of the lever 12, the weight 20 being sufficiently heavy to overcome the resistance to movement of said lever when the rope is deflected by movement of the car. In other words, the weight is substantially a variable fixed point from which a pull or stress is exerted along the rope by the deflection-pulleys on the car to reciprocate the lower portion of the rope, and consequently cause the actuation of the pilot-valve, which controls the stop-motion valve to stop the car or to allow it to be restarted.

Referring now to Fig. 4 in particular, I will describe the operation of the pilot-valve and stop-motion valve in connection with the positions shown in Figs. 1, 2, and 3. Assuming the car in its middle position, as shown in Fig 2, the stop-motion valve and pilot-valve will be in their central positions. The passage 33 from the upper portion of the valve-chest 17 is closed from the supply-port 7 by means of the valve 29, and the valve 30 closes the communication between the exhaust-port 8 and the passage 34, leading from the lower portion of the valve-chest 17 to the pilot-valve 6. To the pilot-valve stem 14 are connected the balancing-pistons 38 and 42 and the valves 39, 40, and 41. The heads 16 and 31 are shown provided with holes 46. If the car is allowed to descend, the deflection-pulleys 27 and 28 will cause the operating-lever 12 to be gradually moved upwardly about the pivot 44 upon the approach of the car to its lower limit of travel. The pilot-valve stem 14 will therefore be moved downwardly to open communication between the supply-port 35 and the chamber below the valve 30, through the pilot-valve cylinder 45 between the valves 41 and 40, through the series of circular holes in said lining, and thence through the passage-way 34 in the valve-chest 17. Furthermore, communication between the chamber above the valve 29 and the pilot exhaust-port 36 is established through the cylinder 45 between the valves 39 and 40, through the circular series of holes in the lining, and thence through the passage-way 33. It will therefore be seen that when the pilot-valve stem is moved downwardly, as shown in Fig. 1, pressure is exerted by the fluid below the valve 30 to move the same upwardly, and this is permitted by the exhaust having been opened to the space above the valve 29. Since the exhaust-port is a small one, it will take some time for the fluid to be forced from above the valve 29, and therefore the valve 30 can move only slowly to close the exhaust-port 8. The automatic stopping of the car will be a gradual stopping, since the valve 30 must move slowly and will therefore gradually close communication between the exhaust-port 8 and the plunger-cylinder 3 through the pipe 5.

It will be noticed that the supply-port 7 is left open to the pipe 5, so that the operator in the car can start the car again by the operation of the main-valve mechanism. Upon the car starting upwardly the lever 12 is again moved by the rope 13, but this time to move the pilot-valves in the opposite direction and past their central positions. This causes the valves 29 and 30 to come back to normal position, and in doing so the pilot-valves are automatically moved to central position by the valve-stem 9 acting on the lever 12 with the connection 18 as a fulcrum. The car may now be stopped and started to cause the same to move up or down from intermediate points.

Upon the car approaching the upper limit of its travel the operation of the stop-motion valve mechanism will be reversed, the relation of the parts being such that the car will be gradually and automatically stopped, said parts being so arranged that the operator may start the car downwardly again and control its intermediate travel the same as before.

In the event of a rope breaking the car would in nearly all cases be stalled at one of the limits of its travel. For instance, if the rope to the right in Fig. 1 should break the weight 20 would pull on the portion of the rope left intact and move the lever 12 downwardly. This would cause the stop-motion valve to cut off the supply and the elevator could not be started up again. If the rope at the left is broken, the car can be moved to its upper limit; but it would be stalled at that point. If the ropes break at all, the breakage would probably occur at the upper or lower limit of travel of the car, because at these points the ropes are under the greatest stress. Only in case both the ropes break, leaving the stop-motion valve in central position, would the stopping of the car depend entirely on the main-valve-operating mechanism. This would probably never occur, as the car would then be in an intermediate position when the stress on the rope is at a minimum. It is therefore seen that my arrangement of operating the stop-motion mechanism is also a safety device in that it insures its proper operation and is always under automatic test. Furthermore, upon the operating-ropes becoming deranged notice is given by the stalling of the car, thus preventing the car from being operated when the stop-motion mechanism is not in operative condition.

Referring now to Fig. 6, it will be explained how the car can be controlled when a main-valve mechanism is used in connection with stop-motion-valve mechanism. 69 designates in general the main-valve-controlling mechanism, which comprises a pilot-valve 70 and a throttling-valve 68, substantially the same as that disclosed in the patent to Cole, No. 700,740, May 27, 1902, for hydraulic valve mechanism. 47 designates the operating-rope, which is arranged to be actuated from the car 1 by means of the usual operating-lever 46. This rope is directed by the pulleys 50 and 51 at the bottom of the elevator-well, so as to maintain the portion connected at 67 to the lever 66 in vertical position. The lever 66 is pivoted at 65 to the bracket 62, which is mounted rigidly on the valve-chest 52. 48 is the supply-inlet, and 49 the discharge-outlet. The supply-inlet 7 of the stop-motion valve communicates with the opening 7′ in the main-valve chest 52 through the pipe 71. The pipe 72 similarly connects the discharge or exhaust openings 8 and 8′. Comparatively small pipes 73 and 74 connect the supply and exhaust openings of the stop-motion pilot-valve with the main valve at points opposite the main supply-pipe 48 and main exhaust-pipe 49, respectively. Rigidly connected with each other and arranged to move in the valve-casing 52 are the motor-piston 53, balancing-pistons 54 and 64, and controlling-valves 55 and 56. The motor-piston is of larger diameter than the valves, so that the former may always be made to move the valves to proper position.

In the position shown in Fig. 6 the car is at its lower limit of travel, the lever 46 having been moved to allow the car to descend. The rope 13 has been deflected to effect the closing of the exhaust-port of the stop-motion valve. The exhaust-port of the main valve, however, is open. Upon moving the operating-lever to the right the pilot-valve 70 is operated to cause the motor-piston 53 to move downward until the valve 56 closes the exhaust-pipe 49 and the communication between the supply-pipes 48 and 7 is entirely open. The elevator-car will thereupon be moved upwardly. In a similar manner when the car is at its upper limit of travel and the valves of the stop-motion mechanism are in their lower position the main valves may be reversed to allow the car to come down again.

Although I have herein shown my invention applied to a hydraulic-elevator system, I desire it to be understood that it is applicable to other systems and to moving bodies other than an elevator-car. In such case the stop mechanism or stop-controlling device, herein shown as a stop-motion valve, would be changed in any suitable manner by those skilled in the art, such change involving merely mechanical skill. For example, the lever 12 could be arranged to operate an electric controller or a steam-valve, &c.

Having thus described the best mode of applying the invention which I have at present devised as an illustration of such invention, I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

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

1. The combination with a car, of a motor therefor, a single stop-controlling device for said motor, flexible means operated by the movement of the car for actuating said stop-controlling device to stop the car at predetermined points in its travel, and means independent of the car and connected to the ends of said flexible means for exerting a pull thereon.

2. The combination with a car, of a motor therefor, a single automatic stop-valve, a flexible connection for positively actuating said stop-valve as the car nears predetermined points in its travel, and means independent of the car and connected to the ends of said flexible connection for keeping the same taut and exerting a pull thereon.

3. The combination with an elevator-car, of a motor therefor, a single automatic stop device for the motor, a rope connected to be automatically actuated by the car to operate said stop device, and means connected to the ends of the rope for keeping the same taut and exerting a pull thereon.

4. The combination with an elevator-car, of a motor for moving the same, a controlling mechanism for the motor, an automatic stop device, means for deflecting the rope to operate the automatic stop device to stop the car as the same approaches its limit of travel, and means connected to the ends of said rope for exerting a pull on said rope.

5. The combination with a movable part of an elevator, of a rope, means connected to the ends of said rope for exerting a stress thereon, and a stop device connected to said rope and having its actuation determined by the direction and extent of deflection of said rope as the car moves in opposite directions, and having the extent of said actuation varied as the car approaches each end of its travel.

6. The combination with an elevator-car, of stop mechanism therefor, a rope connected to said stop mechanism, means on the car for deflecting said rope to effect the operation of said stop mechanism at predetermined limits of travel of said car, and means independent of the car for exerting a constant pull at the ends of said rope.

7. The combination with an elevator-car, of stop mechanism therefor, a rope, means attached to said rope for causing a gradual de-

flection of said rope to gradually actuate said stop mechanism, and means independent of the car for exerting a pull on said rope from its ends.

8. The combination with an elevator-car and stop mechanism therefor, of a rope connected to said stop mechanism, means for causing a gradual deflection of the rope as the elevator-car approaches the end of its run, and retarding means independent of the car againt which a pull is exerted to operate said stop mechanism upon the deflection of said rope near the end of the car's run.

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

10. The combination with an elevator-car and stop mechanism therefor, of flexible means for actuating said stop mechanism, means carried by the car for deflecting said flexible means to effect the operation of said stop mechanism to stop the car at predetermined points in its travel, and take-up means for said flexible means and connected to the ends thereof.

11. The combination with an elevator-car and a stop mechanism therefor, of means for actuating said stop mechanism, a single rope for actuating said means, means for causing deflection of said rope as the car approaches either end of its run, and means connected to the ends of said rope for adjusting the position thereof as the same is deflected.

12. The combination with a movable part of an elevator, of a stop mechanism therefor, flexible means for actuating said stop mechanism, means carried by said movable part for deflecting said flexible means, and a take-up device connected to the ends of said flexible means.

13. The combination with an elevator-car and stop mechanism therefor, of a rope for controlling said stop mechanism, means carried by the car for deflecting said rope, and means supported by said rope and connected to the ends thereof for exerting a constant pull at said ends.

14. The combinaton with a hydraulic-elevator car, of a stop-motion valve therefor, means for operating said valve, a rope for actuating said operating means, means for deflecting said rope to effect the stopping of the car at predetermined points in its travel, and a take-up device connected to the ends of said rope.

15. The combination with an elevator-car, of means for moving the same, means for controlling the operation of said moving means, a stop mechanism, means for operating said stop mechanism, a single rope for actuating said operating means, means carried by the car for deflecting said rope to effect a stopping of the car at predetermined points in its travel, and movable means connected to the ends of said rope to exert tension on said rope.

16. The combination with an elevator-car, of stop mechanism therefor, means for operating said stop mechanism, a rope connected to said operating means, means independent of the car for placing said rope in tension, and means carried by the car for controlling said tension to effect the actuation of said operating means as the car approaches predetermined points in its travel.

17. The combination with an elevator-car, of stop mechanism therefor, a rope, means unattached to the rope for causing a gradual deflection of said rope to gradually actuate said stop mechanism, and a weight connected to the ends of said rope and suspended thereby.

18. The combination with an elevator-car, and a stop mechanism therefor, of a rope, means unattached to the rope for causing a gradual deflection of said rope to gradually actuate said stop mechanism, and a weight suspended at the ends of said rope for exerting a tension throughout its length.

19. The combination with an elevator-car and stop mechanism therefor, of means for operating said stop mechanism, a rope connected to said operating means, means connected to the ends of said rope for exerting a tension along said rope, and means for varying said tension along a portion of said rope to effect the actuation of said operating means at predetermined points in the travel of the car.

20. The combination with an elevator-car, of stop mechanism therefor, fixed sheaves, intermediate fixed pulleys, a rope connected to said stop mechanism and running on said sheaves and guided by said pulleys, additional pulleys fixed to the car for deflecting said rope, and means connected to the ends of said rope for exerting a tension along the same.

21. The combination with an elevator-car and stop mechanism therefor, of a rope unattached to the car for operating said stop mechanism, and single means connected to the ends of said rope for keeping the same taut.

22. The combination with an elevator-car, and stop mechanism therefor, of a rope unattached to the car but connected to said stop mechanism, automatic means for operating such rope, and a single means connected to the ends of said rope for keeping the same taut.

23. The combination with an elevator-car and stop mechanism therefor, of a single rope unattached to the car but connected to the stop mechanism, automatic means for deflecting the rope at predetermined limits of travel of the car, and a weight fastened to both ends of the rope.

24. The combination with an elevator-car, of a valve for controlling the supply of fluid

to operate said car, a weight, a single rope connected to the valve and looped around a fixed pulley near one end of the hatchway and having both its ends passing over a pulley near the other end of the hatchway and secured directly to the weight, and automatic means on the car for deflecting the rope at each end of the travel of such car.

25. The combination with an elevator-car and a single stop mechanism therefor, of a rope unattached to the car for operating said stop mechanism, and single means connected to the ends of said ropes for keeping same taut.

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

KARL E. OSSIAN JANSSON.

Witnesses:
FRANK T. BROWN,
F. H. LINCOLN.