No. 701,326. Patented June 3, 1902.

E. R. GILL.

ELEVATOR.

(Application filed Aug. 25, 1899.)

(No Model.)

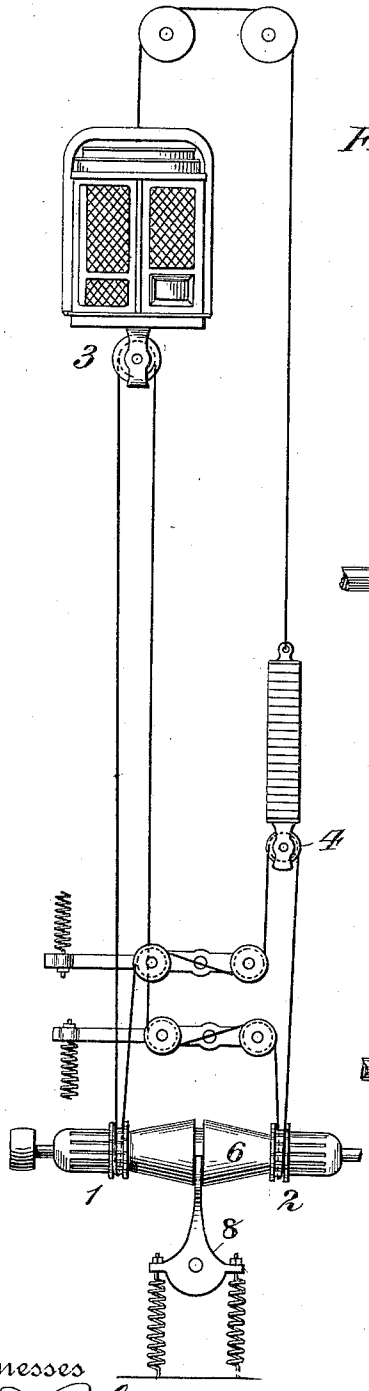


Fig. 1.

Fig. 2.

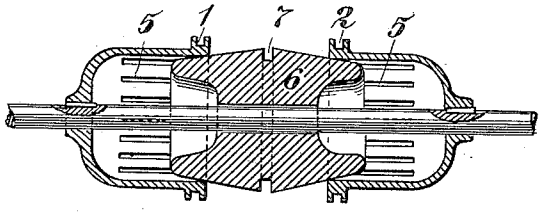
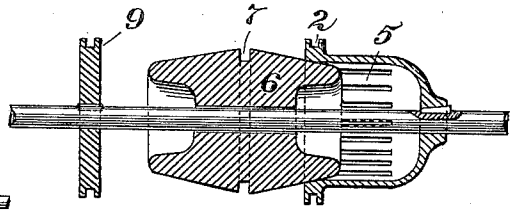


Fig. 3.



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UNITED STATES PATENT OFFICE.

EDWIN R. GILL, OF ENGLEWOOD, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO OTIS ELEVATOR COMPANY, A CORPORATION OF NEW JERSEY.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 701,326, dated June 3, 1902.

Application filed August 25, 1899. Serial No. 728,513. (No model.)

To all whom it may concern:

Be it known that I, EDWIN R. GILL, a citizen of the United States, residing in the town of Englewood, county of Bergen, in the State of New Jersey, have invented a certain new and useful Improvement in Elevators, of which the following is a specification.

This invention relates to means whereby an electric motor may be made available for the safe, economical, and readily-controllable operation of one or more elevators.

One specific object of my invention is the provision of means whereby a single electric motor for either direct or alternating current may be employed for running elevators, the stopping and starting and the changes in direction and speed being accomplished while said motor runs continuously and without operating any switches or other circuit changes.

Another specific object of my invention is the provision of means whereby hoisting means of the above-named type may be safely and easily operated with round hoisting-ropes.

The preferred embodiment of my invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a side view of one modification of my invention, showing the position of parts when the car is at rest. Fig. 2 is a vertical section of the driving apparatus used in one form of my invention, and Fig. 3 is a modification of what is shown in Fig. 2.

In the preferred arrangement shown in Fig. 1 I employ two driving-sheaves 1 and 2, over which there passes a driving-cable in the manner shown arranged in two bights, one of which hangs direct from the stationary block 3 under the car and the other from the stationary block 4 on the counterweight. I prefer to have the driving rope or cable pass over spring take-up devices, as shown in Fig. 1, whereby all slack due to changes in length of the rope or cable may be compensated for.

While in the drawings I have shown my device used with blocks on the car and counterweight, it is to be understood that my invention applies to any arrangement whereby the driving of two bights of cable by means of sheaves 1 and 2 accomplishes the hoisting and lowering of the car.

The sheaves 1 and 2 are made expandible, so that by the use of appropriate means one or the other or both of said sheaves may suffer a change of diameter, thereby producing a change of speed in the bight of cable, surrounding it without change of angular velocity. I prefer to accomplish this end by the use of the apparatus illustrated in the drawings, wherein hollow sheaves are employed, the same being provided with saw-cuts 5, whereby the peripheries of the sheaves are divided into parallel springs, so arranged as to form practically continuous grooved sheaves 1 and 2. The sheaves are mounted upon a driving-shaft, as shown, which shaft may be driven at a constant speed by any form of motive power, and upon the same shaft I prefer to employ a cone 6, adapted to slide on the shaft and to be thrust into the hollow of one or the other of the sheaves. As shown in Fig. 2, cone 6 is made double where it is intended to act upon two expanding sheaves, and for purposes of shifting the cone I prefer to employ a groove 7, in which case the forked shifting-lever 8 is normally held in a middle position, as by the springs illustrated in Fig. 1.

The shifting device 8 may be operated from the car or from some other point by any means not forming a part of my present invention.

It will be evident that with the cone in the middle position, as shown in Figs. 1 and 2, the two sheaves 1 and 2 will have the same diameter, and consequently the hoisting-rope will be fed onto one sheave as fast as it is given off from the other. It will therefore run idle and the car will be at rest.

Upon forcing the cone 6 into the sheave 2 by means of the shifter 8 said sheave will be expanded, and, supposing the driving-shaft to be turned toward the observer in Fig. 1, the fall of rope hanging direct from block 4 will be driven faster than the fall hanging direct from block 3, and in consequence the counterweight will descend and the car rise. The extent to which the cone 6 is shifted will govern the speed with which the car will move, since it governs the degree of difference in

diameter between the two sheaves. It is evident that on shifting the cone 6 in the opposite direction and expanding the sheave 1 the car will be made to descend and the counterweight to rise.

My invention is not limited to the use of a cone with two expanding sheaves; but, as shown in Fig. 3, the cone may be used with one expanding sheave 2 and one sheave of invariable diameter 9. In this form of device as long as the cone is in the position illustrated and the two sheaves 2 and 9 have the same diameter the car will remain at rest. On moving the cone to the left and allowing the sheave to collapse under the tendency of its own resilience the car will move in one direction, and on expanding sheave 2 by thrusting the cone to the right the opposite movement will be imparted to the car.

It is evident that my elevator may be operated either by running the driving means for the two pulleys constantly or that such means may, if desired, be started every time the elevator starts.

My improved elevator is capable of many modifications which will be obvious to the mind of one skilled in this art, and it is to be understood that I do not confine myself to the details shown and described.

What I claim is—

1. In an elevator, an endless driving-cable forming two bights, two driving-sheaves, one in each of said bights and both acting to drive said cable, impelling means for driving said sheaves and means for causing expansion and contraction of at least one sheave.

2. In an elevator, an endless driving-cable forming two bights, two sheaves, one in each of said bights, a common driving means other than said cable for running said sheaves simultaneously, and means for changing the relative diameters of said sheaves.

3. In an elevator, a counterweight and a traveling part moving in opposition to said counterweight, a block connected with said counterweight and a block connected with said oppositely-moving part; in combination with an endless cable forming two bights in said blocks, a driving-sheave in each bight of said cable and means for varying the relative diameters of said sheaves.

4. In an elevator, a counterweight and a traveling part moving in opposition to said counterweight, a block connected with said counterweight and a block connected with said oppositely-traveling part; in combination with an endless cable forming two bights in said blocks, a driving-shaft, two expandible sheaves on said shaft, one for each bight of cable, and means for changing the relative diameters of said sheaves.

5. In an elevator, a counterweight and a traveling part moving in opposition to said counterweight, a block connected with said counterweight and a block connected with said oppositely-traveling part; in combination with an endless cable forming two bights in said blocks, a driving-shaft, two expandible sheaves on said shaft, one for each bight of cable, and means for expanding one or the other of said sheaves at will.

6. In an elevator, an endless driving-cable forming two bights, two sheaves at least one of which is expandible, both being adapted to run simultaneously, one in each bight of said cable, a spring take-up in each bight of said cable and means for controlling the expansion of said expandible sheave.

7. In apparatus for producing motion a driving-shaft with two sheaves fast thereon, at least one of which is hollow and is made of resilient material, and said hollow sheave being composed of parallel movable sections, a driving-cable running over both of said sheaves and a cone adapted to extend more or less into said expandible sheave.

8. In apparatus for producing motion a driving-shaft, two hollow sheaves of resilient material made fast thereon, said sheaves being composed of parallel movable sections, a driving-cable passing over both of said sheaves and a double cone centered on said shaft and adapted to slide on said shaft so as to extend more or less into the hollow of either sheave.

9. The combination, with two rotary pulleys, of a cable engaging both pulleys, a device to be driven connected by said cable with both pulleys and tending to be moved thereby respectively in opposite directions, and means for varying the relative diameters of the driving or cable-engaging faces of the two pulleys, thereby controlling the direction and speed of movement of the driven device.

10. The combination, with differential mechanism consisting of a rotary driven element, rotary driving elements, and a cable connecting and engaging the driving and driven elements, the driving elements tending to move the driven element respectively in opposite directions, a motor operatively connected with the driving elements and driving them at the same angular velocity, and manually-controlled means for controlling the relative peripheral speeds of the cable-engaging faces of the driving elements, thereby controlling the stoppage, direction and speed of the driven element without changing the speed or direction of the motor.

11. The combination, with differential mechanism consisting of a driven pulley, driving-pulleys, and a cable connecting and engaging the driving and driven pulleys, the driving-pulleys tending to move the driven pulleys respectively in opposite directions, a motor, driving connection from the motor to the pulleys, and means for varying the relative peripheral speeds of the driving parts of the driving-pulleys, independently of the operative connections between them and the motor, thereby controlling the relative peripheral speeds of the driving-pulleys of the differential mechanism and the stoppage, direction and speed of the driven pulley.

12. The combination, with a shaft and two pulleys driven therefrom of differential mechanism consisting of a driven device a driving-cable connected with the two pulleys, the driven device being adapted to move to take up the excess of length of the driving-cable fed to and from one pulley over that fed to and from the other, a motor adapted to drive, the shaft, and means independent of said driving connection for varying the relative peripheral speeds of the driving or cable-engaging faces of the two pulleys.

13. In an apparatus of the character described, the combination with a bodily-movable device, of two rotary drivers, the driving-cables extending around a rotary driving-face of one of the drivers, thence around the movable device, and thence around the rotary driving-face of the other device, driving means for the rotary drivers, the controlling mechanism, and means controlled thereby independent of the driving means to vary the relative peripheral speeds of the rotary drivers, whereby said bodily-movable device may be moved in opposite directions and its direction of travel and rate of speed controlled.

14. In an apparatus of the character described, the combination, with a bodily-movable device, of a rotary shaft, two rotary pulleys driven thereby at the same relative angular velocities, the driving-cables extending around one of said pulleys, thence around the bodily-movable device and thence around the other of said pulleys, the controlling mechanism, and means actuated thereby to vary the relative peripheral speeds of said pulleys whereby said bodily-movable device may be moved in opposite directions and its direction of travel and rate of speed controlled.

15. In an apparatus of the character described, the combination with two rotary pulleys, means for driving them, and driving-cables extending around and adapted to be driven by said pulleys, of a bodily-movable device with which the driving-cables engage and which is adapted to move to take up the excess of length of the driving-cable fed to and from one pulley over that fed to and from the other, the controlling mechanism, and means, independent of the driving means, actuated by the controlling mechanism to vary relatively the peripheral speeds of the two pulleys, thereby controlling the travel and speed of the bodily-movable device.

16. In an apparatus of the character described, the combination of two rotary pulleys, means for driving them constantly at the same angular velocities, driving-cables extending around and adapted to be driven by said pulleys, bodily-movable devices with which the driving-cables engage, and which are adapted to move oppositely to take up the excess of length of driving-cable fed to and from one pulley over that fed to and from the other, controlling mechanism, and means actuated thereby to vary relatively the peripheral speed of the cable-engaging faces of the two sheaves, thereby controlling the travel and speed of the said bodily-movable devices.

17. In an apparatus of the character described, in combination, driving-pulleys, cables passing around the same, a motor, driving connection between the motor and the pulleys whereby the same are constantly driven at the same relative angular velocities, the diameters of the driving-faces of said pulleys being capable of being varied with reference to each other, controlling mechanism, and connection between said pulleys and the controlling mechanism whereby the diameters of the driving-faces of said pulleys may be varied with reference to each other by said controlling mechanism, whereby the cables are fed from the pulleys at different relative speeds, and a bodily-movable device adapted to take up the excess of length of cable fed to and from one pulley over that fed to and from the other.

18. In an apparatus of the character described, the combination with two rotary drivers and a bodily-movable device, of the driving-cables connected with the bodily-movable device so as to control the travel back-and-forth movement of the same, the said driving-cables extending around the driving-faces of the two rotary drivers, a motor, a driving connection therefrom to the drivers, the controlling mechanism, and means controlled thereby, and independent of the driving connections, to vary the relative peripheral speeds of the driving-faces of the two rotary devices, causing the movable device to travel in one direction or the other.

19. In an apparatus of the character described, the combination with two bodily-movable devices, of two driving-pulleys, cables engaging said pulleys and in operative connection with the bodily-movable devices, a rotating shaft, said pulleys being driven constantly at the angular velocity of the shaft, and means to vary the diameters of the driving-faces of the pulleys with reference to each other, whereby the movable devices may be fed in opposite directions and at different speeds.

20. In an apparatus of the character described, the combination with two devices to be driven and two traveling sheaves connected respectively to said devices, of two driving-pulleys, a motor, a driving connection from the motor to the pulleys whereby said pulleys are constantly driven at the same relative angular velocities, cables connecting the driving-pulleys and the traveling sheaves, the diameters of the driving-faces of said pulleys being capable of being varied with reference to each other, controlling mechanism, and connection between said pulleys and the controlling mechanism whereby the relative diameters of the driving-faces of said

pulleys may be varied by said controlling mechanism.

21. In an apparatus of the character described, the combination, with two bodily-movable devices, of two rotary drivers, a motor, a driving connection from the motor to the drivers, a driving connection from the rotary drivers to the movable devices, and means to vary the relative peripheral speeds of the driving parts of the rotary drivers without changing their angular velocity.

22. In an elevating apparatus, the combination with two bodily-movable devices, two driving-pulleys, a motor, driving connection from the motor to the pulleys whereby they are driven constantly at the same relative angular velocities, cables connecting the pulleys with the movable devices, and connecting the movable devices with each other, whereby any movement of one movable device will be accomplished during an opposite movement of the other, and means to vary the relative peripheral speeds of the driving-faces of the pulleys, thereby controlling the speed and travel of the bodily-movable devices.

23. In an elevating apparatus, the combination, with two traveling sheaves and two driving-pulleys, of a cable extending from one traveling sheave to one driving-pulley, thence to the other traveling sheave, thence to the other driving-pulley and thence back to the first-mentioned traveling sheave, a motor, a driving connection therefrom to the driving-pulleys, and means to vary the relative diameters of the driving-faces of said pulleys.

24. The combination with a shaft of means for driving said shaft, a pair of sheaves mounted on said shaft, a pair of traveling pulleys, an endless cable looped around said sheaves and pulleys driven by said sheaves, and means for varying the relative diameter of said sheaves.

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