E. BOENING.

ROPE DRIVE ELEVATOR.

APPLICATION FILED OCT. 16, 1906.

964,842. **Patented July 19, 1910.**

Fig. 1

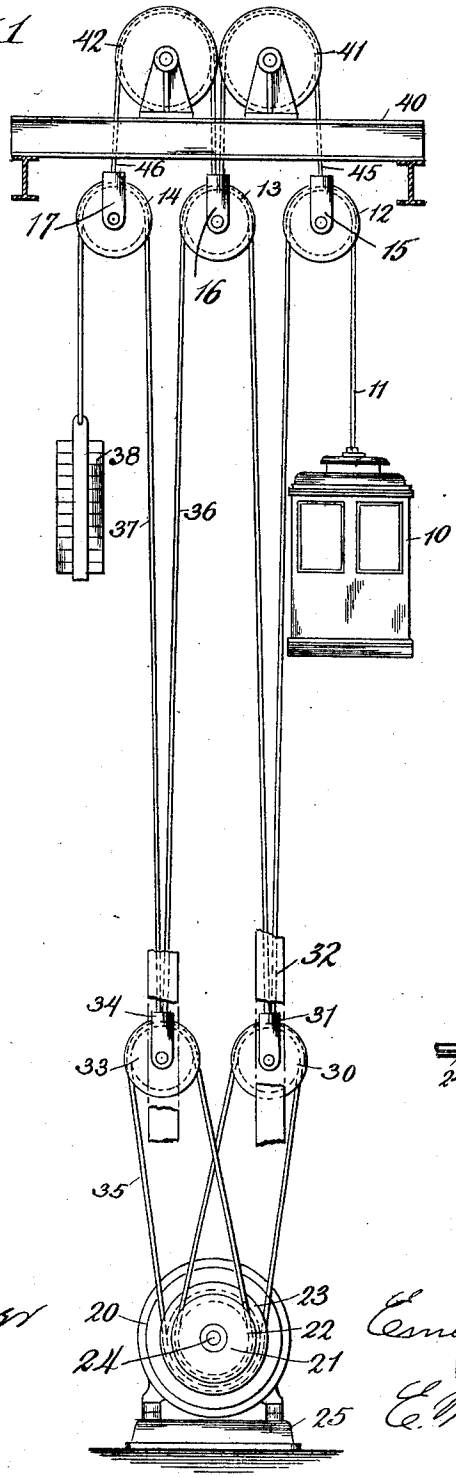
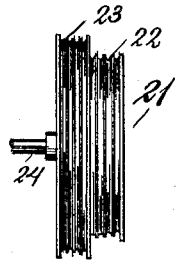


Fig. 2



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ERNEST BOENING, OF YONKERS, NEW YORK, ASSIGNOR TO OTIS ELEVATOR COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ROPE-DRIVE ELEVATOR.

964,842. Specification of Letters Patent. **Patented July 19, 1910.**

Application filed October 16, 1906. Serial No. 339,203.

To all whom it may concern:

Be it known that I, ERNEST BOENING, a citizen of the United States, and a resident of the city of Yonkers, in the county of Westchester and State of New York, United States of America, have invented certain new and useful Improvements in Rope-Drive Elevators, of which the following is a specification.

My invention relates to a rope drive elevator and its object is to improve upon apparatus of this class and to provide a simple and efficient arrangement of parts whereby the tension on the driving ropes of such elevators is automatically maintained and varied.

I will describe my invention in the following specification and point out the novel features thereof in claims.

Referring to the drawings, Figure 1 is a diagrammatic representation in side elevation of an elevator made according to my invention. Fig. 2 is an enlarged view of the driving pulley shown in Fig. 1, the view being taken at right-angles to that in Fig. 1.

Like characters of reference designate corresponding parts in all of the figures.

10 designates an elevator-car of any form of construction. 11 is its hoisting-cable which is attached to the car and run up and over a sheave 12 which is situated near the top of the shaft. This cable is then run down to a movable frame 31 to which it is attached. A sheave 30 is rotatably mounted in this movable frame 31.

32 designates a portion of a vertical guide which may be provided for the purpose of guiding the movement of the frame 31 and the sheave 30. 34 is another movable frame similar to that shown at 31 and guided in a like manner. A sheave 33 is mounted upon the frame 34. One end of a counterweight-rope 37 is attached to the frame 34 which rope, after passing over a sheave 14 situated near the top of the shaft, has its other end attached to a counterweight 38. A third rope 36 is attached to both of the movable frames 31 and 34. This rope is supported by a sheave 13 near the top of the shaft over which sheave the rope runs.

40 designates a portion of the overhead work or frame of the structure in which the elevator is placed. Two sheaves 41 and 42 are supported upon this structure. The sheaves 12, 13, and 14 are, respectively, mounted upon movable bearing blocks 15, 16 and 17. The blocks 15, 16 are connected together by a rope or chain 45 which passes over and is supported by the sheave 41. Similarly, the blocks 16 and 17 are connected together by a rope or chain 46 which passes over and is supported by the sheave 42. The sheaves 12, 13 and 14 are therefore movable under certain conditions in a substantially vertical direction.

20 is a reversible motor such, for example, as an electric motor mounted upon a base 25 which should be rigidly attached to a suitable foundation. 24 is the shaft of this motor upon which shaft is rigidly mounted a differential frictional sheave 21 having rope-grooves 22 of a desired diameter and other rope-grooves 23 of a larger diameter. One or more driving rope or ropes 35 in the form of an endless loop or loops are each run around the two parts of different diameter of the driving sheave and over the traveling pulleys 30 and 33.

The operation of this apparatus to drive the car is obvious, for whenever the motor is rotated in one direction it will cause a part of the driving rope 35 to be driven at a greater rate of speed than another part of the same rope is driven, on account of the two diameters of the rope-grooves on the driving sheave 21. This will cause one of the two traveling sheaves 30 and 33 to be pulled down and will cause the other to be moved up. This movement will be transmitted to the car in one direction. An opposite rotation of the motor will cause the car to be moved in the opposite direction.

By the peculiar arrangement of parts which I have herein described it may be seen that the weight of the car is transmitted to both sides of the driving-rope 35. Likewise, the weight of the counterweight 38 is transmitted to both sides of the driving-rope. If the effective weight of the car is increased by adding a load to the car such increase of weight will also be transmitted to both sides of the rope-loop. Thus, when the load which the driving-sheave is called upon to drive is increased, the tension on the driving rope will be uniformly increased and consequently its frictional contact with the driving sheave will be made greater. This action is entirely automatic and the increase of the friction between the driving sheaves and the driving rope will be pro-

portional to the increase of the load. As the weight of the car and its load is transmitted to both sides of the driving rope a counterweight is not necessary for the purpose of providing required driving friction. The extra tension produced by the increase of load is applied in the most advantageous manner as it is equally distributed through all parts of the driving rope.

I wish not to be limited to the particular construction and arrangement herein disclosed, as various changes might be made within the spirit and scope of the invention.

What I claim is—

1. A driving sheave, a driving rope, an elevator-car arranged to be moved thereby, a counterweight, vertically movable sheaves arranged to support the driving rope, the car and the counterweight, connections between said vertically movable sheaves and the driving rope, car and counterweight, a mechanical support between the car-sheave and the driving-rope sheave, and a second mechanical support between the counterweight sheave and the driving-rope sheave.

2. The combination with a driving sheave, of a rope-loop, an elevator car, a rope or cable connecting the car and rope-loop, vertically movable sheaves, one of which supports said rope or cable, a connection between the other movable sheave and the rope-loop forming a support for the latter, a stationary sheave, and a flexible member engaging said stationary sheave and forming a support for the vertically movable sheaves.

3. A driving sheave, a rope-loop, an elevator-car, a rope connecting the car and the rope-loop, a counterweight, a rope connecting the counterweight and the rope-loop, movable sheaves arranged to support the rope-loop, the car-rope and the counterweight rope and operatively connected to said parts respectively, a fixed sheave, a rope over said sheave and connected to the car-rope sheave and to the loop-rope sheave, a second fixed sheave, and a rope over said sheave and connected to the counterweight sheave and to the rope-loop sheave.

4. A driving sheave, a rope-loop, an elevator-car, a rope connecting the car and the rope-loop, a counterweight, a rope connecting the counterweight and the rope-loop, vertically movable sheaves connected to and arranged to support the rope-loop, the car-rope and the counterweight-rope, vertically movable bearing blocks for said sheaves, a fixed sheave, a stationary bearing for said sheave, a rope over said sheave and connected to the movable bearing block of the car-rope sheave and to the movable bearing block of the rope-loop sheave, a second fixed sheave, a stationary bearing for the sheave, and a rope over said sheave and connected to the movable bearing block of the counterweight sheave and to the movable bearing block of the rope-loop sheave.

5. The combination with a differential driving sheave, of a rope-loop, an elevator car, a car rope connecting the car and rope-loop, a movable sheave, a connection between the movable sheave and the rope-loop, a movable sheave arranged to support the car, and a mechanical support between and for said movable sheaves.

6. A sheave having driving surfaces of different diameters, a rope-loop in frictional contact with both of said driving surfaces, an elevator-car connected to the rope-loop and arranged to be moved thereby, a vertically movable sheave arranged to support the rope-loop, a vertically movable sheave connected to and arranged to support the car, and a mechanical support between the movable sheaves for said sheaves.

7. A sheave having driving surfaces of different diameters, a rope-loop in frictional contact with both of said driving surfaces, a pair of traveling sheaves in the rope-loop, an elevator-car connected to one of said traveling sheaves, a vertically movable sheave operatively connected to and arranged to support the traveling sheaves and the rope-loop, a vertically movable sheave arranged to support the car, and a mechanical support between the movable sheaves for said movable sheaves.

8. A sheave having driving surfaces of different diameters, a rope-loop in frictional contact with both of said surfaces, a pair of traveling sheaves in the rope-loop, guides for said traveling sheaves, an elevator-car connected to one of said traveling sheaves, a vertically movable sheave connected to and arranged to support the traveling sheaves and the rope-loop, a vertically movable sheave arranged to support the car, a fixed sheave, and a rope over said fixed sheave and connected to the car-supporting-sheave and to the rope-loop supporting-sheave.

9. The combination with a differential driving sheave, of a rope-loop, vertically movable sheaves, a car, a counterweight, a rope connecting the car and loop and supported by one of said vertically movable sheaves, a rope connecting the counterweight and said loop and supported by another of said vertically movable sheaves, a rope or cable supported by a third vertically movable sheave and forming a support for the rope-loop, a mechanical support between the car rope sheave and the driving rope sheave, and a second mechanical support between the counterweight rope sheave and the driving rope sheave.

10. A sheave having driving surfaces of different diameters, a rope-loop in frictional contact with both of said surfaces, a pair of

traveling-sheaves in the rope-loop, an elevator-car, a counterweight, vertically movable sheaves operatively connected to and arranged to support the traveling-sheaves and the rope-loop, the car and the counterweight, a mechanical support between the rope-loop sheave and the car-sheave, and a second mechanical support between the rope-loop sheave and the counterweight sheave.

11. A sheave having driving surfaces of different diameters, a rope-loop in frictional contact with both of said surfaces, a pair of traveling-sheaves in the rope-loop, guides for said traveling-sheaves, a rope connected to said traveling-sheaves and arranged to support the traveling-sheaves and the rope-loop, an elevator-car, a rope connecting the car to one of said traveling-sheaves, a counterweight, a rope connecting the counterweight to the other of said traveling-sheaves, movable sheaves arranged to support the traveling-sheaves-connecting-rope, the car-rope and the counterweight-rope, movable bearing blocks for said movable sheaves, a fixed sheave, a stationary bearing for said sheave, a rope over said sheave and connected to the movable bearing-block of the car-rope sheave and to the movable bearing-block of the traveling-sheaves-connecting-rope, a second fixed sheave, a stationary bearing-block for said second fixed sheave, a rope over said sheave and connected to the movable bearing-block of the counterweight sheave and to the movable bearing-block of the traveling-sheave connecting-rope.

12. The combination with a driving sheave, of a driving rope, a car and counterweight operatively connected to the driving rope, vertically movable sheaves arranged to form supports for the car and counterweight, stationary sheaves, supporting ropes connected to said vertically movable sheaves and extending over the stationary sheaves, and a connection between said supporting ropes and the driving rope.

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

ERNEST BOENING.

Witnesses:
ELLA LUCHS,
ERNEST W. MARSHALL.