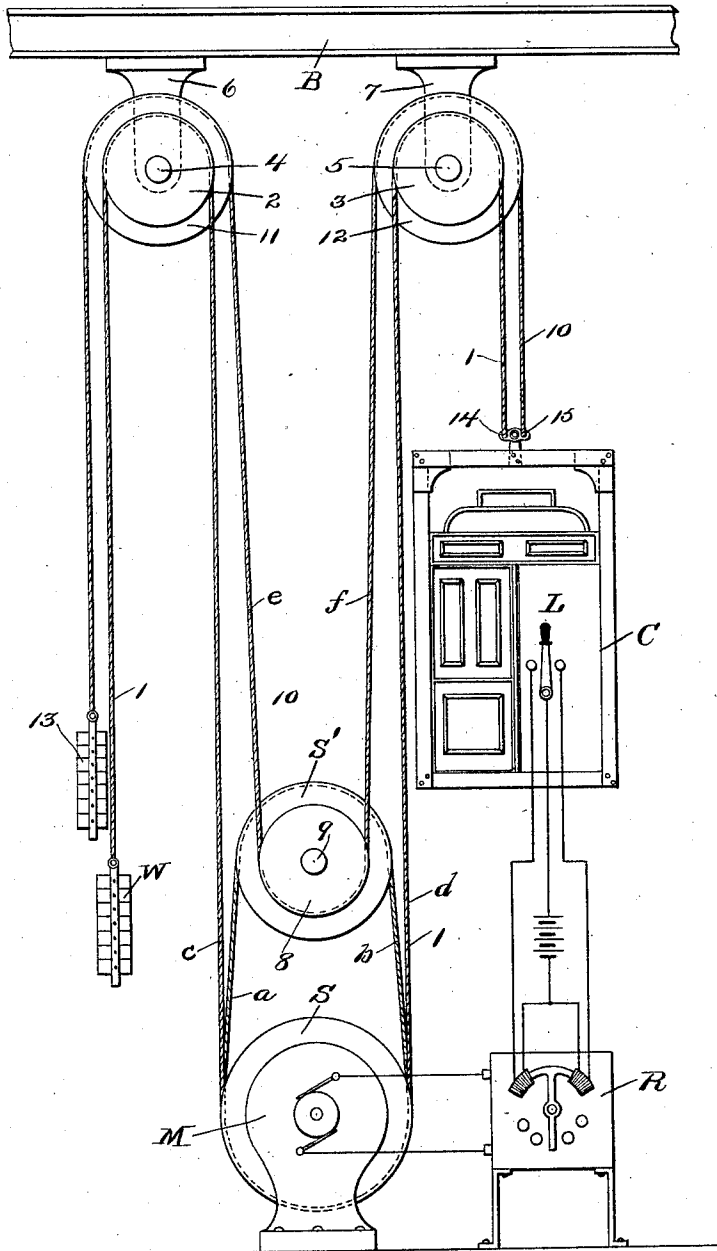


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 ROPE DRIVE ELEVATOR.
 APPLICATION FILED SEPT. 6, 1906.

1,016,691.

Patented Feb. 6, 1912.



WITNESSES:

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ROPE-DRIVE ELEVATOR.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN D. IHLDER, a citizen of the United States, residing in New York city, in the county of New York and State of New York, have invented a new and useful Improvement in Rope-Drive Elevators, of which the following is a specification.

My invention relates to rope drive or traction elevator apparatus and one of its objects is the provision of means to relieve the strain of power-transmitting means on the frictional driving apparatus.

A further object of the present invention is the provision of means for counteracting the strain on the bearings of the driving sheave and tension sheave of traction elevator apparatus.

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

In the accompanying drawing a traction elevator system is shown diagrammatically with my invention applied thereto.

M designates a motor which in this instance is operated by electricity and controlled by the switch L in the car C through the starting rheostat R. To the motor shaft is secured the driving drum or sheave S at a suitable distance above which is mounted a loose sheave S'. The driving rope or cable 1 is connected to the car at 14 and then passes over the sheave 3 which is pivoted at 5 to the suspended support 7 attached to the overhead fixed beam B. From the sheave 3 the cable 1 passes down to the lower side of the sheave S, thence upwardly around the upper portion of the tension sheave S', thence downwardly again around the sheave S, and finally up around the overhead sheave 2 to the counterweight W. The sheave 2 corresponds to the sheave 3 and is pivoted at 4 to a support 6 attached to the beam B in a similar manner.

The usual way of driving the car has heretofore been to lead the driving rope around the driving sheave and from thence around the loose sheave, back again to the counterbalance, as just explained. This produces a very heavy strain upon the bearings of the driving sheave or drum as well as on the loose or tension sheave. To relieve this strain I use part of the ropes from the car and lead them directly around the loose

sheave, this rope preferably having a separate counterbalance. In this instance I have shown a rope or cable 10 connected to the car at 15 and passing upwardly over the sheave 12 and thence downwardly around the lower portion of the sheave 8, upwardly around the overhead sheave 11, and finally to the counterweight 13. For the sake of facilitating the tracing of the different ropes, I have shown the sheaves 2 and 11, 3 and 12, and 8 and S' as of different diameters, respectively, and designated them as if they were in each instance separate sheaves. It should be understood, however, that the sheaves 2 and 11 are substantially of the same diameter and fixed to each other; or said sheaves may be a single sheave with a double groove for the ropes 1 and 10. So also the sheaves 3 and 12 are of substantially the same diameter and fixed to each other so that they will rotate together. The sheaves 8 and S' must be connected to each other either directly or by means of a key on the shaft 9 so that said sheaves will rotate as a single sheave. It will therefore be evident that the sheaves 8 and S' may be substituted by a double grooved sheave. In other words, not only are the sheaves 8 and S' of substantially the same diameter, but they must be mounted or connected to each other in such a manner as to rotate together in order to effect the objects of the invention. The weight of the two counterweights should be properly proportioned according to the weight of the car and its load. The strains on the bearings of the driving sheave S and the loose tension sheave S' are varied by any variation of the counterbalance weight. In some cases it is possible to so design the apparatus and make such a selection of connections that the up and down pressure on the loose sheave bearings is almost entirely counteracted or equalized, and the strain on the driving sheave is reduced to substantially one-half.

Merely by way of illustration of the operation of my invention, the following conditions may be assumed. Suppose the car to weigh 4950 lbs. and the counterweight 2200 lbs., in an ordinary traction elevator system including the car C, counterweight W, and sheaves S and S'. It has been found in practice that the strain on the lead winding on the drum is about 50% greater than

the strain on the lead winding off the drum. Therefore, if the motor is operating the elevator system to lift the car, the strain on the lead *a* will be about 3300 lbs., and since the sheave *S'* is now a tension sheave only, the strain on the lead *b* will also be 3300 lbs., but the strain on the lead *c* will be 2200 lbs. There is now a strain on the bearing 9 of 6600 lbs., which is equal to the sum of the strains on the leads *a*, *b*. The strain on the bearings of the motor shaft will be equal to the sum of the strains on the leads *a*, *b*, *c*, and *d*, which is equal to 13,750 lbs. If, now, the weight of the car is assumed to be the same, and the counterbalance divided between the counterweights *W* and 13, it may easily be seen how the stresses or strains on the bearings are relieved when the additional rope 10 is added in the manner illustrated in the drawing. Suppose the weight *W* to be 880 lbs., and the weight 13 to be 1320 lbs., the sum of these two being equal to 2200 lbs., the weight of the counterbalance when the rope 10 is omitted. While the car is being lifted, the strain on the lead *b* is 1320 lbs. or 50% greater than the strain on the lead *c*, which is 880 lbs. It should be noted here that by the connection of the rope 10 to the sheave 8 which rotates with the sheave *S'*, the latter becomes a traction sheave as well as a tension sheave for the reason that when the driving sheave *S* rotates and pulls on the lead *b* it must transmit power to the sheave 8 and cable 10 to assist in lifting the car. Therefore, the strain on the lead *a* becomes about 50% greater than the strain on the lead *b*; the strain on the lead *a* therefore being 1980 lbs., the strain on the lead *d* is 2970 lbs. The strain on the lead *e* is due to the counterweight 13, or 1320 lbs., and since the sheave *S'* is now a traction sheave, the strain on the lead *f* is 1980 lbs. The sum of 1980 and 2970 is 4950 or the weight of the car. It will now be seen that there is an upward pull on the shaft 9 due to the strains in the leads *e* and *f*, which is equal to 3300 lbs. The downward pull on the shaft 9 is also 3300 lbs. or equal to the sum of strains in the leads *a* and *b*, 1980+1320. The upward pull on the bearings of the motor shaft is now equal to 880+1320+1980+2970,=7150. From this particular illustration it will be evident that retaining the same amount of counterbalance and weight of car and load, the stresses or strains on the bearings of the tension sheave may be substantially counteracted or balanced and the upward pull on the bearings of the motor shaft reduced to almost one-half. Under the conditions assumed, the stresses on the motor shaft bearings is equal to 13,750 lbs. without the rope 10, and only 7150 lbs. when the rope 10 is connected as shown in the drawings.

There is no restriction to the number of ropes which can be used and it is not necessary to increase the number of ropes used above that which will be employed in the old way of running the ropes. The number of ropes used depends of course on the amount of counterbalance.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of my invention, and I desire therefore not to be limited to the precise construction herein disclosed, nor to any particular distribution of the counterbalance in the weights *W* and 13.

Having thus described my invention, what I claim and desire to have protected by Letters Patent of the United States is:—

1. In frictional driving apparatus, the combination with a motor and a driving sheave, of a tension sheave adapted to rotate about a fixed axis and in substantially the same plane as the driving sheave, a load carrying device, a power transmitting means, and means for counteracting the normal strain of the power transmitting means on said sheaves.

2. In frictional driving apparatus, the combination with a frictional driving sheave, of an additional sheave approximately in the same plane as said driving sheave and arranged to rotate upon a fixed axis, a load carrying device, power transmitting means, and means for relieving the normal strain on said additional sheave due to the power transmitting means.

3. The combination with a frictional driving apparatus comprising two stationary sheaves on different axes, of a load carrying device, power transmitting means, a counterweight, a flexible connection between said load carrying device and counterweight independent of said power transmitting means and associated with said driving apparatus to relieve the strain of the power transmitting means thereon.

4. The combination with a motor, motor controlling means, a driving sheave and a tension sheave, said sheaves having separate axes of rotation, of power transmitting means, a load carrying device, a counterweight, and a flexible connection between the car and counterweight independent of said power transmitting means and associated with the tension sheave to relieve the strain of the power transmitting means on the bearings both of said tension sheave and said driving sheave.

5. The combination with frictional driving apparatus, of a load-carrying device, a counterweight, a flexible driving member secured at one end to the load-carrying device and at the other end to said counterweight, said driving member being also associated with the frictional driving apparatus

tus, an additional counterweight, and a connection between said additional counterweight and the load-carrying device, said connection being associated with a part of said frictional driving apparatus.

5 6. The combination of a motor, motor controlling means, a frictional driving drum, a tension drum, a car, a counterweight, a cable connecting the car and counterweight
10 and passing around portions of each of said drums, and an additional cable having a running connection with said tension drum and exerting tension thereon in opposition
15 to the first-named cable to relieve the strain of the first-named cable on the tension drum.

7. In a traction elevator, the combination with a traction sheave, of a loose sheave, an elevator car, a hoisting cable means for counterbalancing the car, and means for relieving the strain of the hoisting cable on
20 the bearings of said traction sheave and loose hseave.

8. In a traction elevator, the combination with a traction sheave, of a loose tension
25 sheave an elevator car, counterbalancing means for the car, a driving cable associated with said sheaves, and an additional cable associated with the said loose tension sheave to relieve the strain on the bearings of both
30 the traction sheave and tension sheave.

9. In a traction elevator, the combination

with a car and a counterweight, of a motor, motor-controlling means, and driving drum, a loose tension drum above the driving drum, a driving cable connecting the car and counterweight, and passing around the lower
35 portion of the driving drum and the upper portion of the tension drum, an additional counterweight, and an additional cable connecting the car and said last-named counterweight and associated with the lower portion
40 of said tension drum.

10. In a traction elevator, the combination with a driving sheave, of an additional sheave on a different axis, an elevator car, a
45 counterbalance for the car, a driving cable associated with both of said sheaves, an additional cable or cables associated with said additional sheave, and means for transmitting a tension through said additional cable
50 or cables to said additional sheave substantially eliminating the strain on the bearings thereof and at the same time reducing to about a half the strain on the bearings of
55 said driving sheave.

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

JOHN D. IHLDER.

Witnesses:

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W. H. BRADY.