No. 698,412. Patented Apr. 22, 1902.

H. ROWNTREE.

ELEVATOR HOISTING MECHANISM.

(Application filed Sept. 22, 1900.)

(No Model.)

Fig. 1.

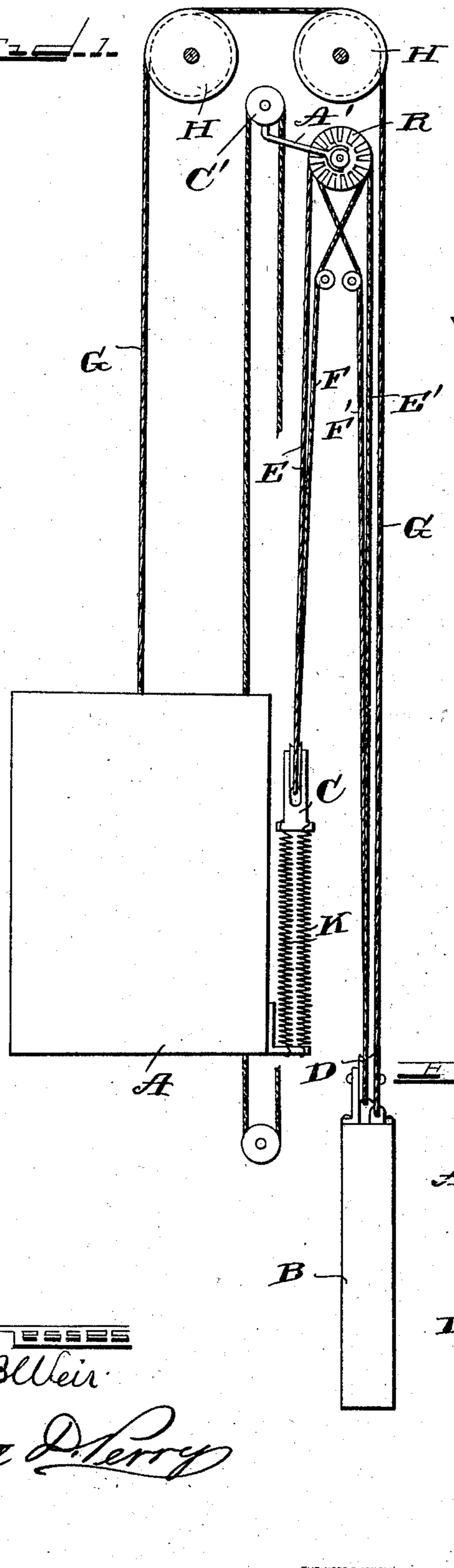


Fig. 2.

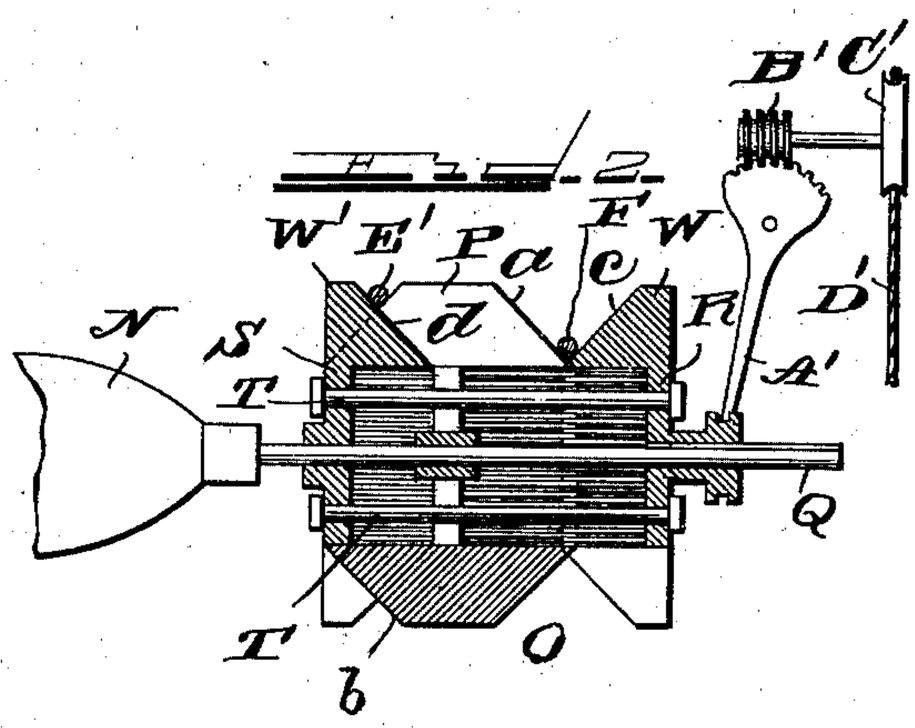


Fig. 3.

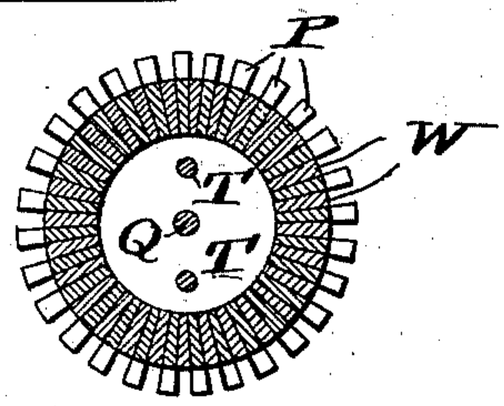


Fig. 4.

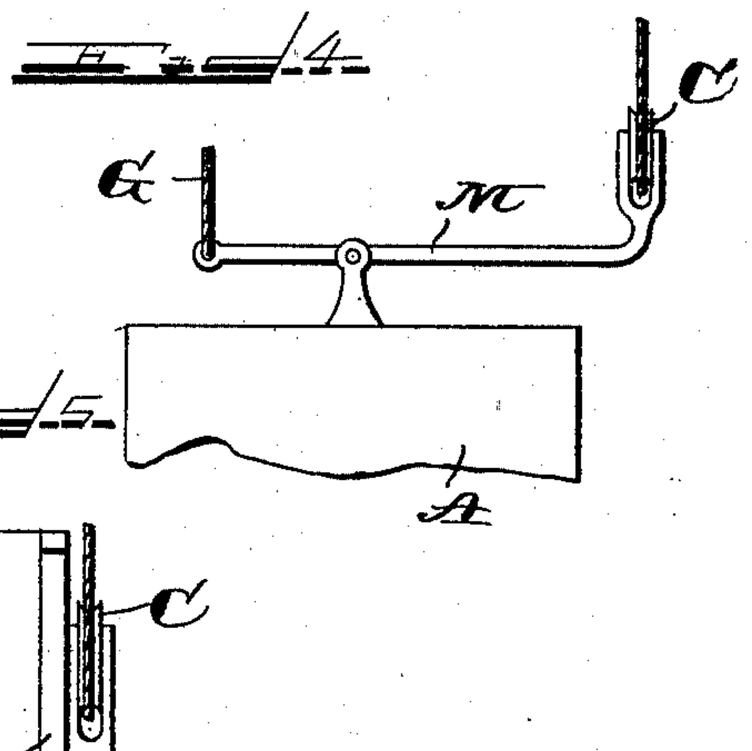
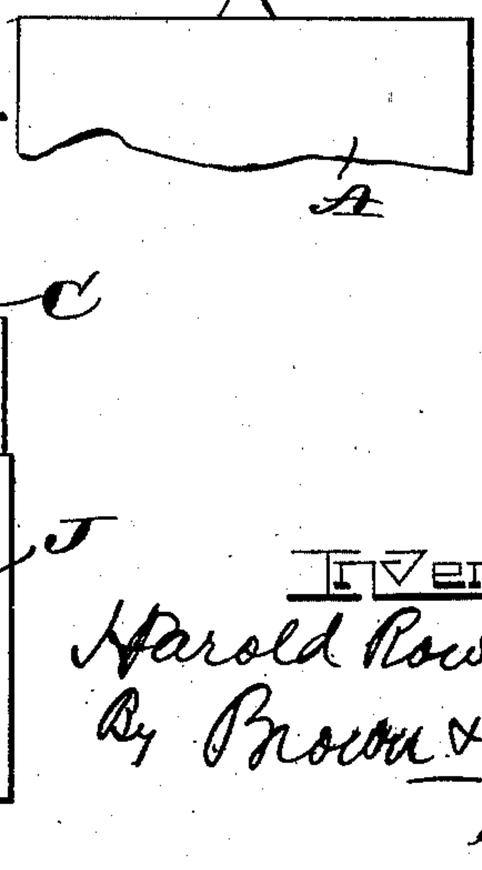


Fig. 5.



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UNITED STATES PATENT OFFICE.

HAROLD ROWNTREE, OF CHICAGO, ILLINOIS, ASSIGNOR TO OTIS ELEVATOR COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

ELEVATOR HOISTING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 698,412, dated April 22, 1902.

Application filed September 22, 1900. Serial No. 30,737. (No model.)

To all whom it may concern:

Be it known that I, HAROLD ROWNTREE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Elevator Hoisting Mechanism, of which the following is a specification.

This invention relates to elevator hoisting mechanism.

The object of the invention is to provide a construction and arrangement which is simple, inexpensive, and efficient for effecting the operation of elevators or other hoisting devices.

Another object of the invention is to provide a construction and arrangement of differential driving or hoisting pulleys for elevators.

Another object is the provision of means whereby such differential hoisting-pulleys may be readily adjusted as to their differential relation.

Other objects of the invention will appear more fully hereinafter.

The invention consists substantially in the construction, combination, location, and relative arrangement, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally pointed out in the appended claims.

Referring to the accompanying drawings, and to the various views and reference-signs appearing thereon, Figure 1 is a view in elevation, somewhat diagrammatical, illustrating a construction and arrangement embodying the principles of my invention. Fig. 2 is a broken detail view, in longitudinal section, of the differential driving-pulley and means for varying the same. Fig. 3 is a transverse section of the differential driving-pulley. Fig. 4 is a broken detail view in diagram, showing a modified construction for attaching the hoisting-cable to the car. Fig. 5 is a similar view showing a modified arrangement for connecting the endless cable to the car.

The same part is designated by the same reference-sign wherever it occurs throughout the various views.

In carrying out my invention I provide an endless hoisting cable or rope and arrange the same to operate over or through sheaves or pulleys respectively connected to the car and to a movable weight, the latter of which may, if desired, form a counterweight for the car and may bear any desired relative proportion to the weight of the car and its load. I also arrange the endless hoisting-cable to operate over differential pulleys, which may be readily adjusted as to their differential relation.

In carrying out my invention I arrange the endless hoisting cable or rope into two bights or loops, in one of which is carried the car sheave or pulley and in the other of which is carried the weight sheave or pulley, and I provide a movable or yielding connection between the car and the car sheave or pulley. If desired and as shown, the movable weight may be connected to the car by an additional cable having its ends connected, respectively, to the weight and to the car and operating over suitable intermediate guide-sheaves or idlers.

Referring to the drawings, reference-sign A designates the car; B, the movable weight; C, Fig. 1, the car sheave or pulley; D, the sheave or pulley carried by or connected to the weight. The portions E F of the hoisting cable or rope form one of the loops or bights thereof and in which is carried the car-sheave. The portions F′ E′ of the hoisting-cable form the other loop or bight, and in which is carried the sheave or pulley D. The rope or cable G is connected at one end to the car A and after passing over the intermediate guide-sheaves H is connected at the other end to the weight B. The yielding or movable connection of sheave C to the car may be effected by means of stout springs K, as shown in Fig. 1, or, if desired, said sheave C may be connected to a weight J, arranged for limited movement relative to the car in the guide or keeper L, (see Fig. 5,) or, if desired, the sheave C may be carried in one arm of a lever M, said lever being pivotally connected intermediate its ends to the car and the cable or rope G being connected to the opposite end thereof. By thus providing the car-sheave with a yielding or movable connection to the car and suspending or connecting such sheave in one of the loops or bights of the hoisting-cable and by suspending or connecting the weight B in

the other bight or loop of the cable said cable is constantly maintained taut and the weight of the car, its load, and the counterweight is distributed between said endless cable and the auxiliary cable G.

Reference-sign N designates the motor, and O the differential pulley over which the hoisting-cable operates. This pulley comprises a central portion made up of plates P, set edgewise and in longitudinal relation with respect to a supporting-shaft Q and are fixed to rotate with said shaft, said plates having beveled ends, as shown at *a b*, Fig. 2. Mounted upon to rotate with shaft Q, but capable of longitudinal movement thereon, are heads R S, said heads being secured together, as by means of the bolts T. Each head comprises plates or fingers W W′ similar to the plates P and so relatively arranged with respect to said plates as to alternate therewith and to operate therebetween, as clearly shown in Figs. 2 and 3. The plates or fingers W are beveled on the ends thereof, as indicated at *c*, the bevels *c* coöperating with bevels *a* to form a pulley-groove to receive the run or leg F F′ of the hoisting-cable. Similarly the plates or fingers W′ are beveled on the ends thereof, as indicated at *d*, the bevels *d* coöperating with bevels *b* to form a pulley-groove to receive the run or leg E E′ of the hoisting-cable. By this construction it will be seen that by shifting the heads R S in one direction or the other the effective diameters of the pulley-grooves may be relatively varied. Any convenient arrangement may be provided for shifting the heads R S. A simple construction is shown wherein a pivoted arm or lever A′ is arranged to engage the hub of head R and is provided with rack-teeth, with which a worm-wheel B′ meshes, upon the shaft of which is carried the pulley C′, which may be rotated from the car by means of an operating-cable D′. Thus I provide an exceedingly simple and efficient construction for varying the differential relation of this driving or hoisting pulley. The shaft Q is driven from the motor. In the particular form shown this shaft constitutes the motor-shaft.

By reason of the differential relation of the pulley-grooves in which the legs or runs E E′ and F F′ operate it will be readily seen that the rotation of such differential pulley will effect a raising or lowering of the car and by varying the differential relation of the pulley-grooves the direction and speed of travel of the car may be varied and controlled without varying or changing the direction or speed of rotation of the driving-motor, thus avoiding any motor-controlling apparatus. Thus when the effective diameters of the pulley-grooves are equal there will be no travel of the car in either direction; but if the diameter of one pulley-groove is increased or decreased relative to the other then there will be a travel of the car in one direction or the other, according to which pulley-groove is of the larger or smaller diameter, and the greater the relative variation of the diameters of these pulley-grooves the greater will be the speed of travel of the car, and since the shifting of the heads R S longitudinally of the shaft Q increases the diameter of one of the pulley-grooves in the same proportion that the diameter of the other groove is decreased the desired variations in speed and direction of travel of the car can be quickly effected.

While I have shown a simple and preferred construction of differential pulley, I do not desire to be limited or restricted to the construction shown, as such illustration is of a construction which is illustrative of the principles involved.

From the foregoing description it will be seen that I provide an exceedingly simple and efficient construction of elevator, wherein the power is applied to raising and lowering the weight, which forms a counterbalance for the car and which is connected to the car, the hoisting-cable being maintained taut by the yielding connection of the car-sheave to the car.

It is obvious that if desired the car sheave or pulley C may be connected to the car at any point and that the endless cable operating over the adjustable differential pulley O may perform the entire function of raising and lowering the car by arranging the car sheave or pulley in the lifting-line of the car and dispensing with the cable G. By the construction and arrangement shown, wherein the car sheave or pulley is arranged out of the lifting-line of the car, the endless and continuously-operating cable may be located in the side or rear of the elevator-well instead of operating in the center of the hatchway.

While a construction of elevator mechanism such as above described is adapted for use generally, it is admirably adapted for use in connection with passenger and freight elevators by reason of its economy and simplicity.

Having now set forth the object and nature of my invention and various constructions embodying the principles thereof, what I claim as new and useful and of my own invention, and desire to secure by Letters Patent, is—

1. In an elevator, a car, a pulley yieldingly connected thereto, a counterweight also provided with a pulley, an endless cable operating around said pulleys, a differential pulley, said endless cable passing around said differential pulley, means for driving said differential pulley, and an auxiliary connection between said car and counterweight, as and for the purpose set forth.

2. In an elevator, a car, a pulley, springs connecting said car and pulley, a counterweight also carrying a pulley, an endless cable operating around said pulleys, a differential pulley, said endless cable also passing around said differential pulley, means for actuating said differential pulley, and an aux-

iliary connection between said car and counterweight, as and for the purpose set forth.

3. In an elevator, a car, a pulley connected to said car for movement relative thereto, a counterweight also carrying a pulley, an endless cable operating around said pulleys, a differential driving-pulley for said cable, an auxiliary cable connecting said car and counterweight, and means for actuating said differential pulley, as and for the purpose set forth.

4. In an elevator, a car, a counterweight therefor, and an endless cable connecting said car and counterweight, in combination with a differential driving-pulley for said cable, comprising a central portion and end portions, said central and end portions coöperating to form pulley-grooves, and means for relatively moving said central and end portions to vary the relative effective driving diameters of said pulley-grooves, as and for the purpose set forth.

5. In an elevator, a car, a counterweight, and an endless cable connecting said car and counterweight, in combination with a differential driving-pulley for said cable, comprising a central portion having beveled ends and end portions having coöperating beveled ends, said bevels forming pulley-grooves, and means for relatively shifting said central and end portions to vary the relative effective driving diameters of said grooves, as and for the purpose set forth.

6. In an elevator, a car, a counterweight, and an endless cable connecting the same, in combination with a shaft, a differential driving-pulley mounted thereon, and comprising a central portion and end portions, said end portions being connected to rotate with said shaft but capable of movement longitudinally thereof and relatively to said central portion, said end and central portions coöperating to form pulley-grooves, and means for shifting said end portions longitudinally of the shaft, whereby the relative diameters of said pulley-grooves are varied, as and for the purpose set forth.

7. In an elevator, a car, a counterweight, pulleys together respectively carried by said car and counterweight, an endless cable operating over said pulleys, an auxiliary cable also connecting said car and counterweight, means for operating one of said cables, and means for distributing the load between said cables, as and for the purpose set forth.

8. In an elevator, a car, a pulley connected thereto, a counterweight also provided with a pulley, one of said pulleys being yieldingly connected, an endless cable operating over said pulleys, means for actuating said cable, and an auxiliary cable connecting said car and counterweight, as and for the purpose set forth.

9. In an elevator, a car, a counterweight, an endless cable connecting said car and counterweight, an auxiliary cable also connecting said car and counterweight, a differential pulley over which said endless cable operates, means for actuating said pulley, and means for distributing the load between said cables, as and for the purpose set forth.

In witness whereof I have hereunto set my hand, this 18th day of September, 1900, in the presence of the subscribing witnesses.

HAROLD ROWNTREE.

Witnesses:
E. C. SEMPLE,
S. E. DARBY.