No. 610,481.

Patented Sept. 6, 1898.

E. M. FRASER.

ELEVATOR.

(Application filed July 29, 1898.)

(No Model.)

2 Sheets—Sheet 1.

FIG. 1.

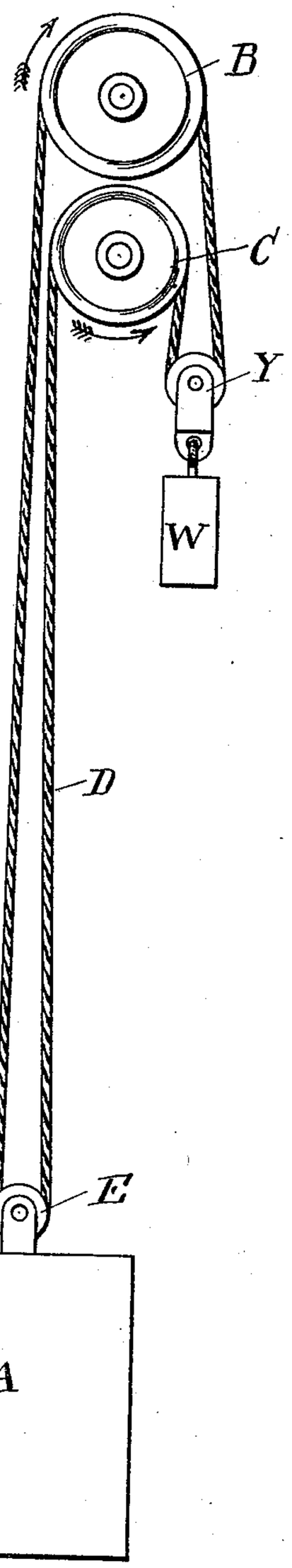
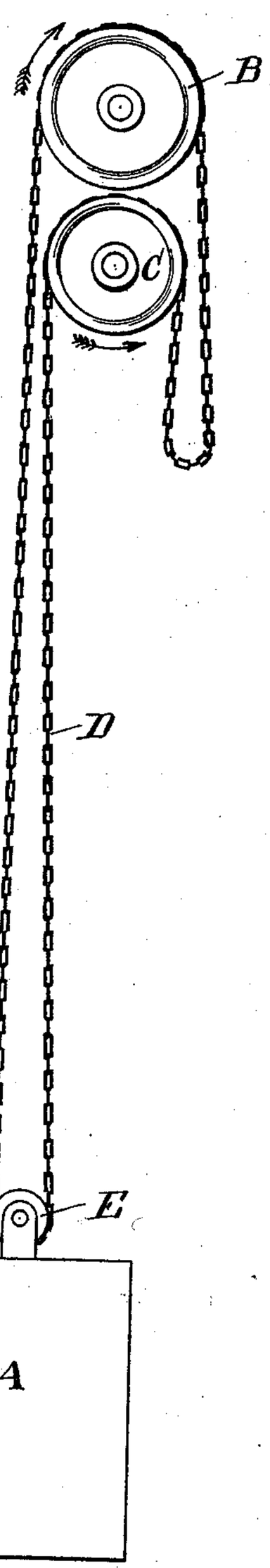


FIG. 2.



WITNESSES.

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A. H. Ste. Marie.

INVENTOR

Ethelbert M. Fraser

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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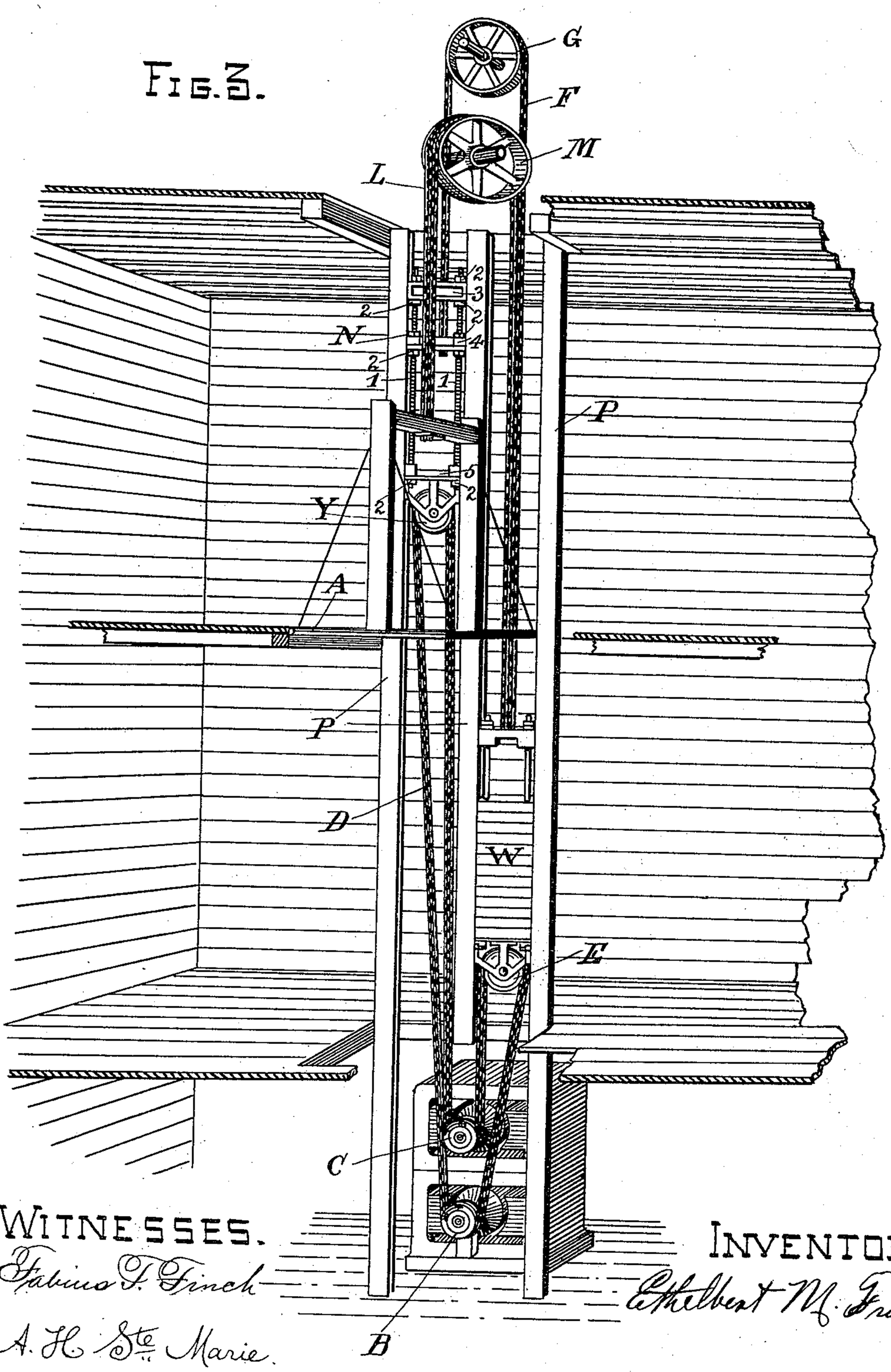
FIG. 3.



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UNITED STATES PATENT OFFICE.

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ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 610,481, dated September 6, 1898.

Original application filed November 27, 1896, Serial No. 613,653. Divided and this application filed July 29, 1898. Serial No. 687,207. (No model.)

To all whom it may concern:

Be it known that I, ETHELBERT M. FRASER, of the city and county of San Francisco, in the State of California, have invented a new and useful Improvement in Elevators, of which the following is a specification, this application being a division of my application filed November 27, 1896, Serial No. 613,653.

This invention relates to hoisting-machines; and the object thereof is to provide for such machines a mode of construction wherein it is not required to start, stop, and reverse the motive power as often as there is a load to raise or lower—that is to say, a construction in which the actuating mechanism is so made, arranged, connected, and combined that the same may run continuously whether the load is moving or standing still, thereby avoiding the noise, jar, friction, and waste of power occasioned where the motive force has to be started, stopped, and reversed every time a load is lifted or let down.

To carry out my invention, I make use of two driving-pulleys, which rotate independently of each other and are so arranged with the motive power and mechanism which operate them that they may both be driven at one and the same rate of circumferential speed, or the rate of the circumferential speed of either one of them may be changed at any moment, so that it will run either faster or slower than the rate of circumferential speed of the other. An endless rope or its equivalent passes around both of said driving-pulleys and is connected either directly or indirectly with the car, cage, or platform or other weight which is to be raised or lowered. A traveling pulley attached to the said car, cage, or platform is used when the connection of the rope is made directly with the car, cage, or platform. The said driving-pulleys and the motors and mechanism which drive them and the said rope are so constructed, combined, and arranged that each of them will continue to run in one direction without stopping or reversing its motion, while the car, cage, or platform will either be held stationary or will be moved upward or downward, as desired. When the circumferential speed of the two driving-pulleys is the same, the car, cage, or platform will remain stationary. When it is desired to move the car, cage, or platform upward or downward, the rate of circumferential speed of one of the driving-pulleys will be either increased or diminished, so as to be either faster or slower than that of the other, when the load will be moved either upward or downward, according to which one of the driving-pulleys is given the greatest circumferential velocity.

My elevator is operated by changing, as occasion requires, the relative rate of speed at which the different parts of the endless rope run, and this is accomplished by changing the relative rates of speed at which the circumferences of the driving-pulleys run. The endless rope moves the load and is driven by its contact with the circumferences of the driving-pulleys. The particular part of the endless rope that is passing around either of the driving-pulleys runs at the same rate of speed at which the circumference of the driving-pulley runs with which it is in contact. For this reason I use the term "circumferential speed," which in this specification means the speed at which the circumferences of the driving-pulleys run. The said driving-pulleys may be driven by steam, water, electricity, or any other suitable motive power. I make no claim to any specific power or means for driving said driving-pulleys. One kind of power may be used for driving one of the driving-pulleys and another kind of power may be used for driving the other driving-pulley. Means and methods for driving such driving-pulleys are so numerous and so well and commonly known to mechanics that it is not necessary to describe any of them in this specification in order to enable any ordinary mechanic to construct and operate my elevators.

Referring to the drawings hereunto annexed, which form a part of this specification, Figure 1 is a side elevation of an elevator or hoisting-machine which shows one of the simplest combinations of mechanical elements in which my invention can be embodied. Fig. 2 is a similar view, but showing a

sprocket-chain instead of a rope and weight. Fig. 3 is a perspective view of an elevator which shows the invention embodied in a more extensive combination of mechanical elements than is shown in either of the other figures. The form of construction and the combination of parts shown in Fig. 3 are, as I consider, the best mode in which I have contemplated applying the principle of my invention.

In all three figures similar letters of reference refer to corresponding parts.

In Fig. 1, A represents the car, cage, platform, or other weight that is to be raised or lowered. B and C are two driving-pulleys, each of which rotates independently of the other and each of which is driven by any of the methods already well known to the mechanical world for driving power-transmitting pulleys and changing and regulating their velocity at pleasure and which need no description here. D is an endless rope that passes around both of the driving-pulleys and also around traveling pulleys E and Y. E is a traveling pulley that carries the car, cage, or platform A, which is attached thereto. Y is another traveling pulley that carries a weight W, which is attached thereto. The traveling pulley E is carried in one of the loops or bights of the endless rope, and the traveling pulley Y is carried in another loop or bight of the said rope, as shown. The weight W is necessary for the purpose of securing frictional contact of the endless rope with the peripheries of the driving-pulleys B and C, and thereby prevent its slipping thereon. The weight W to the extent of its own gravity will act as a counterweight to the load that is carried in the other bight or loop of the endless rope and may be made as heavy as desired for such purpose.

The operation of the elevator shown in Fig. 1 is as follows, viz: The driving-pulleys are set in motion in the directions shown by the arrows. While they are both traveling at the same rate of circumferential speed, the endless rope will run throughout its entire length at one and the same uniform rate of speed, and the load A will not be moved in either direction, but will remain stationary. To raise the load A, either the circumferential speed of the driving-pulley B is increased or else the circumferential speed of the driving-pulley C is decreased. In either case the part of the rope that is running over the driving-pulley B will run faster than that part of the rope which is running over the other driving-pulley C. This change in the relative circumferential speed of the driving-pulleys will cause the load A to be drawn upward, and the weight W will descend by its own gravity. By reversing the relative circumferential speed of the driving-pulleys the load A will descend by its own gravity, and the weight W will be drawn upward.

It is evident that the driving-pulleys may be run in directions opposite to those shown by the arrows in the drawings; also, the direction of motion of either of the driving-pulleys with reference to each other may be changed by crossing the rope and passing it around one of the driving-pulleys in an opposite direction from that shown in the drawings, and the operation of the elevator will still remain substantially the same.

Fig. 2 shows a combination that is similar to that of Fig. 1, except that instead of a rope it shows an endless flexible chain of the kind known as "machine-chains," in which the links are all made of one uniform size, and except also that the grooves in the circumferences of the driving-pulleys B and C are made of the proper form to carry said chain and with depressions in them of the proper sizes and forms to receive said links and prevent the chain from slipping in the grooves. No tension-weight is required in the construction shown in Fig. 2, as the weight of the chain is sufficient to keep it in its place without any further weight being added to it. In other respects the operation of the elevator shown in Fig. 2 is the same as that of the elevator shown in Fig. 1.

Fig. 3 is a perspective view of an elevator embodying the invention in another and more extended form. It is composed of the frame P, two driving-pulleys B and C, a platform-car A, a counterweight W, two stationary friction-pulleys G and M, one rope or set of ropes L passing over the stationary friction-pulley M and connecting the counterweight to the car, another set of ropes F, that pass over the stationary friction-pulley G and connect the counterweight with the tightening or tension apparatus N, two traveling pulleys E and Y, the first of which is attached to the counterweight W and the other of which is attached to the tightening apparatus N, and an endless rope or set of ropes D, which pass around both of the said two driving-pulleys and also around both of said traveling pulleys. In this elevator I have placed the tightening apparatus between the ends of the ropes F and the traveling pulley Y; but I do not limit my invention to the precise point at which the tightening apparatus is placed, for its location may be varied at will. There are many forms of tightening and tension devices well known to mechanics, many of which may be substituted in place of the particular form of tension device that is shown in said Fig. 3. No claim is therefore made to the particular form of tension device that is shown in Fig. 3. Indeed it is entirely practicable to construct and operate the elevator without any tension device whatever in it, although it is preferred to use some form of tension apparatus, and a tension device of one form has therefore been shown in said Fig. 3. The particular form of tension device shown in Fig. 3 is constructed as follows, viz: Two vertical rods 1, with screws cut their entire lengths, are made. Each one of these vertical rods passes through three cross-bars 3 4 5, near the respective ends of

the latter. The cross-bars are held in their proper position by nuts 2, that work up and down on said screw-rods. One of said cross-bars is near the upper end of the said screw-rods, and another of the cross-bars is near the bottom of the two screw-rods. The third cross-bar is placed on the screw-rods, between the upper and lower cross-bars. This third cross-bar has nuts both above and below it, by means of which it may be moved upward and downward along said screw-rods. The rope or ropes F pass downward through the upper cross-bar and are fastened to said third cross-bar. The traveling friction-pulley Y is fastened by a bracket to the said lower cross-bar. By forcing the said third cross-bar downward the rope or ropes F and the endless rope or ropes D will be tightened and their tension increased, while by raising the said third cross-bar upward the same ropes will be slackened. By connecting the end of the rope or set of ropes F directly to the traveling pulley Y in Fig. 3 the operation of the elevator will be the same, except as to the tension of the ropes F and D, when the tension device is left entirely out as it is when the tension device is put in, as shown in said figure. By making the tension apparatus in the form shown in Fig. 3 the ends of the cross-bars may be formed so as to run in or upon vertical guides in the frame, and thereby keep the line of movement of the tension apparatus and the traveling pulley Y connected thereto in the exact position desired for obtaining the most perfect operation.

In Fig. 3 are shown three sets of ropes. Each one of the said sets contains more than one rope. By this arrangement the ropes of each set reinforce each other and thereby furnish additional strength. There are as many grooves in the driving-pulleys for the ropes to run in as there are ropes, and thereby great additional frictional adherence of the endless ropes to the driving-pulleys is obtained. Where, however, the elevator is so light that a single rope will do the work required of each one of the sets of ropes, a single rope may be used in place of each one of said sets of ropes without any change being made in the invention or in the operation of the elevator. By the construction and arrangement of the parts shown in said Fig. 3 the elevator-platform is connected to the counterweight alone. In this Fig. 3 the platform is not directly connected with either the endless rope or ropes or with the traveling pulleys or with the driving-pulleys. The load is connected with and is operated by the counterweight alone. By preference the counterweight is made to overbalance the platform A by about one-half the weight of an ordinary load that is to be carried by said platform. When the counterweight is drawn downward, it draws the platform A and its load upward. When the counterweight is drawn upward by the rope or ropes F, the platform descends by reason of its own gravity alone. The elevator shown in said Fig. 3 is, in my judgment, one of the best and most practicable forms of elevators in which my invention can be embodied.

Ropes and chains are here referred to; but it is evident that any cable suitable for the purpose may be used, and in using the word "cable" I include all of the chains, ropes, or cables which have heretofore been used and which are adapted for use in this connection.

Having now described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. An elevator having a car, cage, or platform and containing two driving-pulleys which are capable of being driven at the same and also at different relative rates of circumferential speed, and an endles cable that passes around both of said driving-pulleys and which is connected with said car, cage, or platform so as to control its actions, all of said parts being so arranged and combined that the said driving-pulleys and said endless cable will each run continuously in one direction and the said car, cage, or platform will remain stationary when the said driving-pulleys are running at the same relative rates of circumferential speed, but will move either upward or downward when the relative rates of circumferential speed of said driving-pulleys are changed so that one of them will run either faster or slower than the other, all substantially as herein set forth and described.

2. The combination in an elevator of two driving-pulleys which are capable of being driven at the same and also at different relative rates of circumferential speed, a load that is to be raised or lowered, an endless cable provided with bights or loops that is connected with the load and controls its actions, two traveling pulleys the first of which pulleys is carried in one of said loops or bights of the endless cable and the second of which is carried in another of the loops or bights of the endless cable, a cable that is connected at one of its ends with the first of said traveling pulleys and after passing around a friction-pulley is connected at its other end with the second of said traveling pulleys, the said friction-pulley, and a tension apparatus, all of said parts being so arranged and combined that the driving-pulleys and endless cable will each run continuously in one direction and the load will remain stationary when the driving-pulleys are running at the same relative rates of circumferential speed but will move either upward or downward when the relative rates of circumferential speed of the driving-pulleys are changed so that one of them will run either faster or slower than the other, all substantially as herein set forth and described.

3. In an elevator the combination of a car, cage, or platform, two driving-pulleys that are capable of being driven at the same and also at different relative rates of circumfer-

ential speed, a counterweight, two stationary friction-pulleys, a cable or set of cables passing over one of said stationary friction-pulleys and connecting the counterweight with the car, cage, or platform, in such a manner that when the counterweight descends it will draw the car, cage, or platform upward, and when the counterweight ascends it will allow the car, cage, or platform to descend by its own gravity, another cable or set of cables passing over the other of said stationary friction-pulleys and being connected at one end to the said counterweight and at the other end to a traveling friction-pulley, two traveling friction-pulleys, one of which is the one that is connected to one end of said last-mentioned cable or set of cables and the other of which is attached to the bottom of said counterweight, and one or more endless cables that pass around both of the said driving-pulleys and also around both of the said traveling friction-pulleys, all combined and arranged substantially as herein set forth and described and so that the driving-pulleys and endless cable or cables will each run continuously in one direction and the car, cage, or platform will remain stationary when the driving-pulleys are running at the same relative rates of circumferential speed but will move either upward or downward when the relative rates of circumferential speed of the driving-pulleys are changed so that one of them will run either faster or slower than the other.

4. In an elevator the combination of a car, cage, or platform, two driving-pulleys that are capable of being driven at the same and also at different relative rates of circumferential speed, a counterweight, a tightening device, two stationary friction-pulleys, a cable or set of cables passing over one of said stationary friction-pulleys and connecting the counterweight with the car, cage, or platform in such a manner that when the counterweight descends it will draw the car, cage, or platform upward and when the counterweight ascends it will allow the car, cage, or platform to descend by its own gravity, another cable or set of cables passing over the other of said stationary friction-pulleys and being connected at one end to the said counterweight and at the other end to a traveling friction-pulley, two traveling friction-pulleys one of which is the one that is connected to the end of said last-mentioned cable or set of cables and the other of which is attached to the bottom of said counterweight, and one or more endless cables that pass around both of said driving-pulleys and also around both of said traveling friction-pulleys, all combined and arranged substantially as herein set forth and described and so that the driving-pulleys and endless cable or cables will each run continuously in one direction and the car, cage, or platform will remain stationary when the driving-pulleys are running at the same relative rates of circumferential speed but will move either upward or downward when the relative rates of circumferential speed of the driving-pulleys are changed so that one of them will run either faster or slower than the other.

5. The combination, with independently-operated pulleys, of an endless cable thereon, a cage connected to and operated by said endless cable, and means for driving said pulleys at the same or relatively-different rates of circumferential speed.

ETHELBERT M. FRASER. [L. S.]

Witnesses:
A. H. STE. MARIE,
L. C. FRASER.