No. 693,907. Patented Feb. 25, 1902.

H. ROWNTREE.

SAFETY DEVICE FOR ELEVATORS.

(Application filed May 20, 1901.)

(No Model.)

Fig. 1.

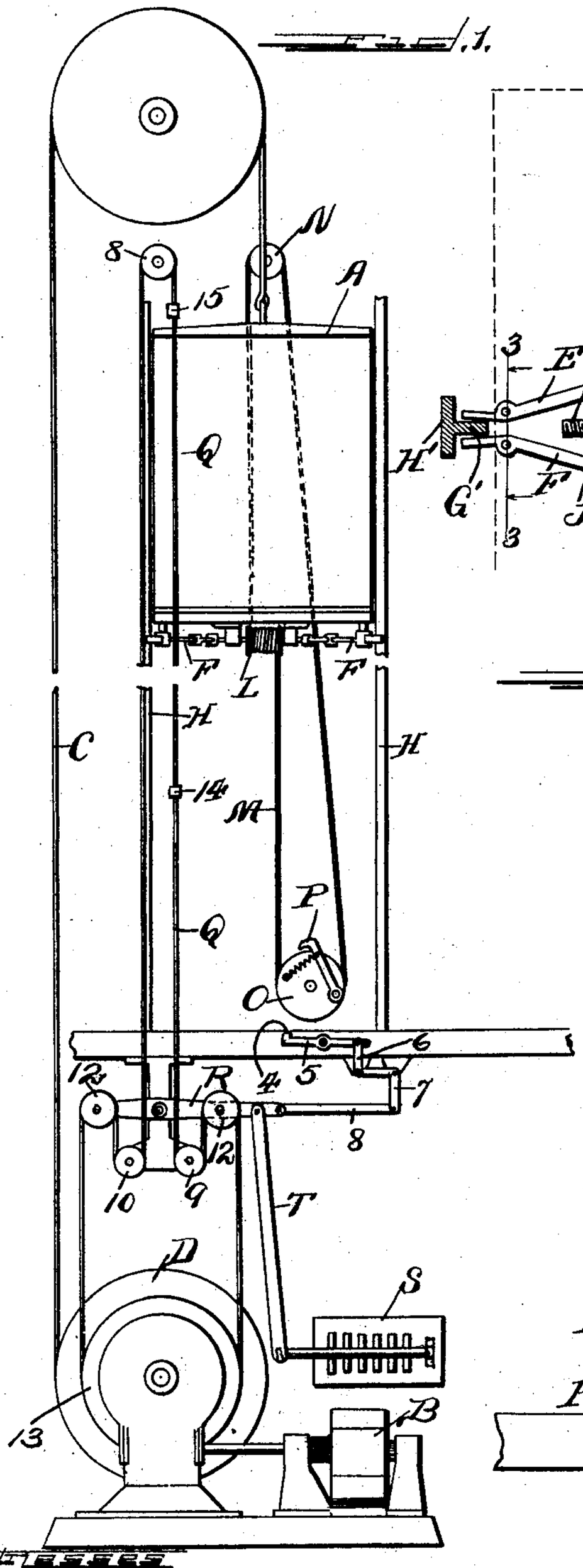


Fig. 2.

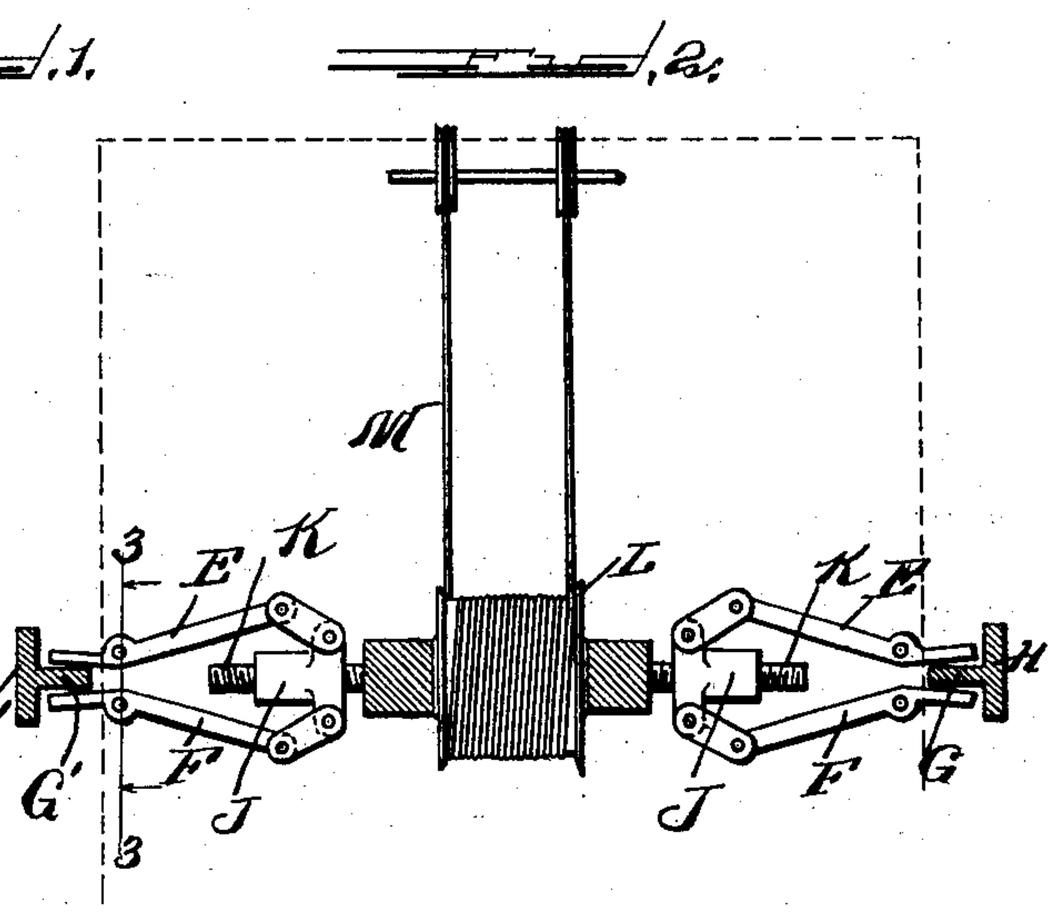


Fig. 3.

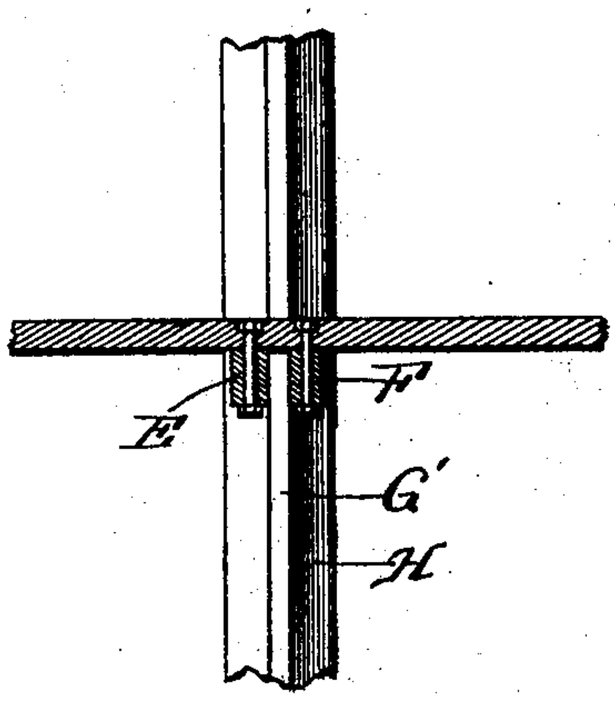
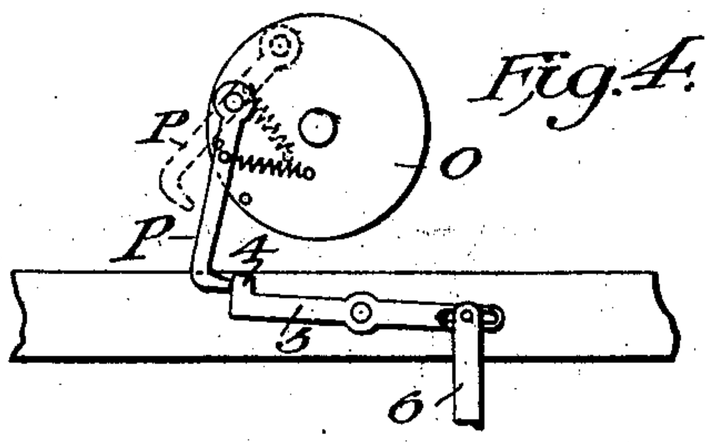


Fig. 4.



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UNITED STATES PATENT OFFICE.

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SAFETY DEVICE FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 693,907, dated February 25, 1902.

Application filed May 20, 1901. Serial No. 61,018. (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 Safety Device for Elevators, of which the following is a specification.

This invention relates to safety devices for elevators.

The object of the invention is to provide a construction and arrangement of safety devices for elevators wherein the point at which the safety devices operate may be varied.

A further object of the invention is to provide means operated by the elevator-hoisting-motor control mechanism for automatically varying the point at which the safety devices operate.

A further object of the invention is to provide means whereby the point at which the safety devices operate may be varied according to the speed of the car.

Other objects of the invention will appear more fully hereinafter.

The invention consists, substantially, in the construction, combination, location, and 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 broken view in elevation of an elevator and hoisting and control mechanism therefor and showing the application of a variable safety device and the combinative arrangement thereof with the elevator-hoisting-mechanism control devices and embodying the principles of my invention. Fig. 2 is a detail view, parts in section, of a construction of safety device adapted for use in connection with my invention. Fig. 3 is a broken detail view in section on the line 3 3, Fig. 2, looking in the direction of the arrows. Fig. 4 is a detail view showing the pawl P in engagement with detent 4.

In the construction and operation of elevator-hoisting mechanism for passenger, freight, or other purposes it is usual to provide safety appliances arranged to operate in case the car-hoisting cable should break or the control of the hoisting mechanism should be lost to automatically set and lock the car against movement, thereby preventing the cage or car from falling to the bottom of the elevator shaft or well. It has generally been the custom to arrange such safety appliances to operate or to set when the car attains a certain speed of travel, the safety appliances being set with special reference to the speed of travel of the car, usually at a point somewhat higher than the speed at which it is designed to operate under ordinary conditions. In such cases, however, it is necessary for the car to attain the requisite speed of movement before the safety appliances will operate, and it sometimes occurs that the car-hoisting cable will break when the car is only a short distance from the bottom of the shaft or well, so that the car or cage will fall to the bottom before it attains the degree of speed necessary for setting or operating the safety appliances, but still with sufficient force to injure, maim, or kill the occupants of the car.

It is among the special purposes of my invention to provide means whereby the point at which the safety appliances operate is varied according to the speed of travel of the car. Thus in accordance with the principles contemplated in my invention if the car is running at a comparatively slow speed the safety appliances are set to operate at a correspondingly-reduced speed somewhat in excess of the slow speed at which the car operates, and when the car is running at a high speed the speed at which the safety appliances operate is correspondingly varied, so as to be set or to operate when the car attains a speed of travel somewhat in excess of the high rate at which it is operating under normal conditions. This generic idea may be embodied in a wide variety of specifically different constructions, and the desired automatic variation of the speed at which the safety appliances are operated or set to correspond with the speed of travel of the car may be effected by the elevator-hoisting-motor controlling mechanism, so that when said controlling mechanism is actuated to vary

the speed of travel of the car the speed at which the safety appliances will operate is correspondingly and coincidently varied.

Referring to the accompanying drawings, reference-sign A designates the car or cage, B the hoisting-motor therefor, and C the hoisting-cable. These parts may be of the usual or any well-known type or construction. In the particular form shown, to which, however, the invention is not limited, the motor B is an electric motor and operates a hoisting-drum D, over which the hoisting-cable C operates.

The particular form or construction of safety device employed is immaterial so far as my invention is concerned and any specific form of construction of safety device may be employed. I have shown a safety device of ordinary construction comprising pivoted clamping-arms E F, carried by the car and having the ends thereof arranged to receive therebetween the flange G of the usual guide-rails H, arranged in the elevator shaft or well. The free ends of the clamping-arms E F are connected by links in the usual manner to nuts J, mounted to travel upon the threaded ends K of a rod, upon which is mounted a spool or drum L. Coiled upon drum L is a cable or rope M, leading from said drum over fixed pulleys or sheaves N O, arranged at the top and bottom, respectively, of the elevator shaft or well. When the pulleys or sheaves N O are free to rotate, it will be observed that the drum L constitutes, in effect, a securing means for the rope or cable M, and hence said rope or cable will travel with the car. If, however, one or the other of said sheaves or pulleys N O is locked against rotation, then the travel of the car causes a pull on said rope or cable, and consequently a rotation of drum L. The rotation of said drum causes the nuts J to travel upon the threaded ends K, and thereby, through the link connections with the clamp-arms E F, effecting a clamping of the clamp-arms against the guide-flange G of the guide-rail H. Carried by one of said sheaves or pulleys—as, for instance, sheave or pulley O—is a pivoted pawl or lever P, adapted to be swung out by centrifugal force when rotation is imparted to said pulley or sheave, and since the speed of rotation of said pulley or sheave is dependent upon the travel of the car the degree of projection or swing of pawl or lever P is also dependent upon the speed of travel of the car. In the usual construction of safety appliances of this nature the pawl-lever P, when the car attains a predetermined rate of speed, engages a suitable fixed projection or detent to lock the sheave O against rotation, thereby effecting an operation of the safety device, and it has been the usual custom, as above explained, to so relatively adjust and arrange the locking detent or projection with reference to the point at which it is engaged by the pawl-lever P that such engagement will occur when the car reaches a speed of travel somewhat in excess of its normal maximum speed. Consequently if a break of the hoisting-cable occurs when the car is a comparatively short distance from the bottom of the elevator shaft or well the car will reach and strike the bottom with serious results before it attains the degree of speed necessary to effect the engagement of the lever-pawl P with its locking detent or projection, and this is the difficulty which I propose to remedy by providing an adjustable detent or stop for the pawl-lever P and which detent or stop is under the control of the elevator conductor and is automatically shifted or moved toward or out of engaging relation with respect to the pawl-lever P, according to the speed of travel of the car. This automatic variation or adjustment of the locking detent or projection may be effected in many different ways. In the particular form shown I arrange said locking detent or projection to be moved coincidently with the actuation of the motor-control mechanism. It is obvious that any ordinary, simple, or convenient motor-control mechanism may be employed. I have shown one form of such control mechanism, which is of the ordinary construction, but to which my invention is not to be limited or restricted and wherein I employ a hand-cable Q, suitably connected to a rocking lever R in such manner that when said hand-cable is operated in one direction the lever R is rocked in a corresponding direction and when said hand-cable is operated in the other direction said lever is also correspondingly rocked. The hoisting-motor controller is indicated generally by reference-sign S and may be of any suitable or convenient construction, dependent upon the character of the motor. For instance, when an electric motor is employed the motor controller S will be in the form of an electric switch, having a suitable connection—as, for instance, through lever T—with the control-lever R in the usual or any ordinary or convenient manner.

Reference-sign 4 designates the stop or detent with which the pawl-lever P coöperates to effect a locking of the safety-device-operating sheave or pulley O, and suitable connections are interposed between said locking detent or stop and the motor-controller-operating lever R, so that when said operating-lever is shifted or moved to vary the speed of travel of the car the locking detent or projection 4 is correspondingly moved toward or from the path described by the centrifugal pawl-lever P, according as the motor-controlling mechanism is shifted into position to effect a rapid or a slow speed of travel of the car. The interposed connections between the locking detent or projection 4 and the hoisting-motor-controlling mechanism may be of any suitable form adapted for the purposes in view. In the particular form shown, to which, however, I do not desire to be limited or restricted, the locking detent or projection 4 is

formed on or carried by a lever 5, pivotally mounted and connected at one end thereof through a link 6 to one arm of a bell-crank lever 7, pivotally supported at its angle, the other arm of said bell-crank lever being connected by a link 8 to the control-lever R. These parts are so relatively arranged that when the lever R is in position to arrest the hoisting-motor the projecting stop or detent 4 occupies the nearest position thereof with reference to the path described by the projecting end of the centrifugal pawl-lever P, and when said lever R is shifted in one direction or the other from said neutral or central position to start up and increase the speed of travel of the car the locking stop or projection 4 is automatically and proportionately moved away from its nearest approach to the periphery of sheave or pulley O, thus making it necessary for the car to attain a proportionately greater speed of travel before the safety appliances are actuated. In this manner it will be observed that the actuation of the safety appliances is dependent upon the intended speed of travel of the car, and the point at which the safety appliances operate varies according to the intended speed of travel of the car, and it is evident that in its broadest and generic conception the invention is not dependent upon the specific construction of the safety appliance nor upon the specific construction or arrangement of the hoisting-motor-controlling mechanism, and consequently a hoisting-motor-controlling mechanism of any usual or approved type or construction may be employed.

The form of hoisting-motor-controlling mechanism shown is, however, particularly effective in connection with the automatic variation of the point at which the safety appliances may be actuated and embodies certain important and coöperative features which I will now describe.

The hand-cable shown is of the type known in the art as the "running" cable, said cable operating over a pulley 8 at the top of the elevator shaft or well and fixed pulleys 9 and 10 at the bottom of the elevator shaft or well and pulleys or sheaves 11 and 12, carried by the rocking lever R, and thence around a pulley or sheave 13, mounted upon to rotate with the hoisting-drum shaft. From this construction it will be seen that the hand-cable travels with and in the same direction as the car. It is desirable, however, that said cable operate or travel at a slower speed than the speed of travel of the car, but in the same direction. Consequently I propose to employ a pulley or sheave 13, over which said control-cable operates, of smaller diameter than the diameter of the hoisting-drum, and by this arrangement the speed of travel of the car exceeds the speed of travel of the control-cable, thus enabling the operator or elevator-conductor to manipulate the control-cable more readily and easily to effect the actuation of the mechanism which controls the speed of travel of the car. I also provide the control-cable with suitable stop devices 14 15, arranged to be engaged automatically by the car as it approaches the extreme limits of travel thereof, it being remembered that the car travels at a greater rate of speed than the control-cable, thereby enabling the car to overtake the stops 14 or 15, as the case may be, and effect an automatic actuation of the control-cable to arrest the hoisting-motor as the car approaches the limits of its travel in either direction, and from the connections above described the automatic actuation of the control-cable as the car approaches the limits of its travel also effects a corresponding automatic adjustment or variation of the point at which the safety appliance will operate.

From the foregoing description it will be seen that I provide an exceedingly simple and efficient automatic safety mechanism, and I also provide simple and efficient means for automatically varying the point at which said safety mechanism operates. It will also be seen that through the connections between the hoisting-motor-controlling mechanism and the safety appliances said safety appliances are under the constant control of the operator, and in case of accident—as, for instance, should the hoisting-cable break or should the elevator attendant lose control of his hoisting-motor—he is still able through the actuation of the control mechanism to automatically set the safety appliances to operate at a slower speed, thus avoiding the danger of serious, if not fatal, accidents.

I do not claim herein the construction and arrangement disclosed of the motor-control cable except as the same is combined with the safety appliances, as the same is claimed, broadly, in my pending application, Serial No. 74,733, filed September 9, 1901.

Having now set forth the object and nature of my invention and a construction embodying the principles thereof, and having explained such construction, its purpose, function, and mode of operation, what I claim as new and useful and of my own invention, and desire to secure by Letters Patent, is—

1. In an elevator, safety devices, and means for automatically varying the speed at which the safety devices are actuated, as and for the purpose set forth.

2. In an elevator, the combination of safety devices, and means controllable from the car for varying the speed at which the safety devices are actuated, as and for the purpose set forth.

3. In an elevator, the combination of safety devices arranged to be actuated by an undue speed of travel of the car, and means for varying the point at which the safety devices are actuated with reference to the speed of travel of the car, as and for the purpose set forth.

4. In an elevator, a car, safety devices for arresting the car when said car attains an undue speed, and means for automatically vary-

ing the point at which the safety devices are actuated according as the speed of the car varies, as and for the purpose set forth.

5. In an elevator, a car, means for controlling the speed of the car, safety devices for arresting the car when it attains an undue speed, and means for varying the point at which the safety appliances operate in corresponding relation to the variation in speed of travel of the car, as and for the purpose set forth.

6. In an elevator, the combination of a car and safety devices therefor, of means for controlling the speed of travel of the car, and means for correspondingly varying the speed at which the safety devices will be actuated, as and for the purpose set forth.

7. In an elevator, a car, safety devices therefor, means actuated by the speed of travel of the car for throwing the safety devices into action, and means for automatically varying the speed at which the safety devices are actuated, as and for the purpose set forth.

8. In an elevator, a car, safety devices therefor, means actuated by the speed of travel of the car for throwing the safety devices into action, means for controlling the speed of the car, said means operating to automatically vary the point at which the safety devices are operated, as and for the purpose set forth.

9. In an elevator, a car, safety devices for arresting the car when the latter attains an undue speed, means for controlling the speed of the car, and means actuated coincidently with the actuation of said speed-controlling means for varying the speed at which the safety devices will operate, as and for the purpose set forth.

10. In an elevator, a car, safety devices therefor, means for controlling the speed of the car, and means actuated by said speed-controlling means for varying the point at which the safety devices will be actuated, as and for the purpose set forth.

11. In an elevator, a car, safety devices therefor, means for controlling the speed of the car, means for automatically reducing the speed of the car as it nears the end of its travel, and means actuated coincidently with the actuation of said speed-reducing means for varying the speed at which the safety devices will be actuated, as and for the purpose set forth.

12. In an elevator, a car, means controllable from the car for varying the speed of travel thereof, safety devices for arresting the car when it attains an undue speed of travel, and means actuated by said speed-controlling means for varying the point at which the safety devices will be actuated, as and for the purpose set forth.

13. In an elevator, a car, a hoisting-motor therefor, controlling mechanism for said motor, safety appliances for arresting the motor when it attains an undue speed, a control-cable for actuating said controlling mechanism, means for causing said control-cable to travel at a slower speed than the speed of travel of the car, and means actuated coincidently with the actuation of said control mechanism for varying the speed at which said safety appliances operate, as and for the purpose set forth.

14. In an elevator, a car, a motor therefor, controlling devices for said motor including a running cable, means for imparting a travel to said cable at a slower speed than the speed of travel of the car, means for automatically actuating said cable as the car approaches the limits of its travel, safety appliances, and connections for varying the speed at which said safety appliances operate, said connections being operated by the actuation of said cable, as and for the purpose set forth.

15. In an elevator, a car, a hoisting-motor therefor, controlling devices therefor including a running cable, means for imparting a travel to said cable at a slower speed than the speed of travel of the car, stops mounted on said cable and arranged to be engaged by the car as it approaches the limits of its travel, safety devices for the car, and means actuated from said cable for automatically varying the speed at which said safety devices operate, as and for the purpose set forth.

16. In an elevator, a car, safety devices therefor, means for automatically reducing the speed of travel of the car as it approaches the limits of its movement, and means actuated coincidently therewith for varying the speed at which said safety devices operate, as and for the purpose set forth.

17. In an elevator, a car, safety devices therefor, means for automatically reducing the speed of travel of the car as it approaches the limits of its movement, and means actuated thereby for correspondingly varying the speed at which the safety devices operate, as and for the purpose set forth.

In witness whereof I have hereunto set my hand, this 14th day of May, 1901, in the presence of the subscribing witnesses.

HAROLD ROWNTREE.

Witnesses:
EDWIN C. SEMPLE,
CHARLES H. SEEM.