B. EPSTEIN.

ELEVATOR.

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959,327. **Patented May 24, 1910.**

Fig. 1.

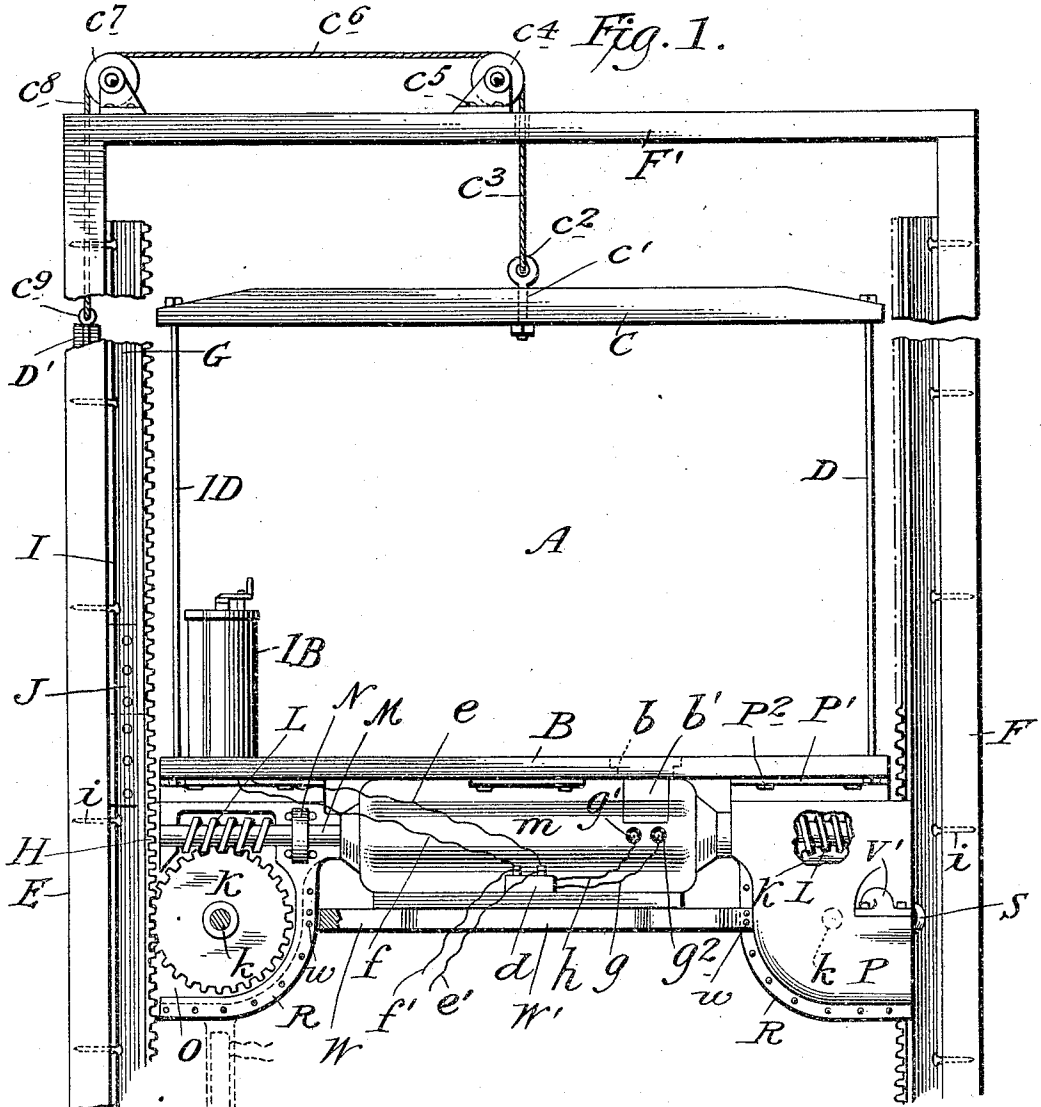
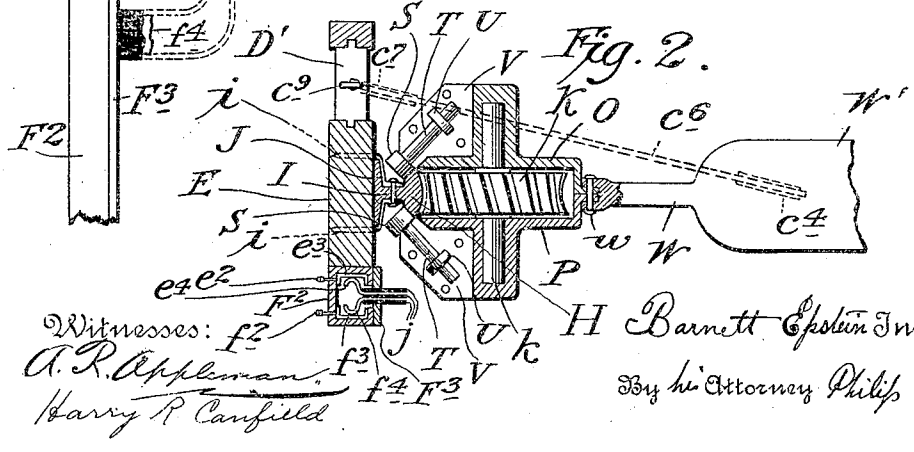


Fig. 2.



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UNITED STATES PATENT OFFICE.

BARNETT EPSTEIN, OF NEW YORK, N. Y.

ELEVATOR.

959,327. Specification of Letters Patent. Patented May 24, 1910.

Application filed February 18, 1909. Serial No. 478,728.

To all whom it may concern:

Be it known that I, BARNETT EPSTEIN, a citizen of the United States, residing in the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Elevators, of which the following is a specification.

My invention in elevators relates to that class adapted to the transportation of freight and passengers and has particular reference to types of such elevators wherein the motive power apparatus is carried by the car or platform and adapted to propel the same by engaging supplementary structure located along or in the elevator shaft, and it is with reference to this type that my invention is more particularly directed.

The object of my invention is to provide primarily in an elevator of the character referred to an effective power transmission system embracing the highest type of safety device, and secondly to provide an inexpensive and durable construction which may be readily applied to an elevator shaft or way for either freight or passenger elevators or hoists, and the various features characteristic of my invention whereby I attain these objects are depicted in the drawings hereto attached and the descriptive matter relative thereto, which when taken together constitute the specification and the distinct features of novelty are pointed out finally in the claims.

With reference to the drawings, Figure 1 is a side elevational view of my improved elevator and the ways along which the same tracks and guides, a section of the upper portion of the ways being removed, and a portion of the gear case likewise being removed, and Fig. 2 is an enlarged, fragmentary cross sectional detailed view through the gear box and ways.

In both figures similar characters of reference are employed to designate like parts, wherein—

A refers to an elevator car comprising a platform or sill B, a lifting truss C, and side frames or pilasters D and 1^D uniting the sill and lifting truss. The elevator thus constituted is supported by a pair of diametrically oppositely situated columns or ways E and F through a joist or beam F′ carried thereby and hung from the beam F′ and through an eye bolt C′ centrally secured to the beam C, by an eye C^2 through which is rove one terminal C^3 of a counter-balancing cable which is rove around a sheave C^4 axially mounted and carried by a standard C^5 secured to the beam F′ intermediately, and a horizontal portion C^6 of the cable is rove around a second sheave C^7, which turns vertically downward and the vertical portion C^8 is secured at its terminal to an eye bolt C^9, engaging a counter-balancing weight D′ sliding in the ways E. The proportioning of the counter-balancing weight D′ to that of the car A and the load which the same is designed to carry is such as to comply with the practice, in elevator construction, for those operated through cable transmission.

The principle upon which my improved elevator is operated involves the rack and pinion system of transmission driven by a worm gear, the former being secured to the ways and the latter electrically driven is carried under the car by the floor thereof. The former is referred to at G which consists of preferably a steel girder rail having a rounded tread H and a comparatively broad flange or foot I. These are composed preferably of sections and are united at their abutting terminals by angle bars and bolts J in a well known manner (in railroad construction.) The rails G thus coupled up are carried by and secured to the respective ways E and F by means of bridge bolts or spikes *i* in a well known manner.

The rails G I shall occasionally refer to hereinafter as a track and the same have their tread surface H cut to form a rack to engage a worm wheel K, revolving on an axle *k* in a bearing within the frame-work which is driven by a screw or worm L coupled with the motor shaft M of an electric or other suitable motor *m*.

In the construction as illustrated the two opposing rails as G constitute a track or way along which the elevator car travels, and a single electric motor *m* is employed to drive the car through the gear K. I have duplicated this gear for both the opposing rails as G but have arranged them to rotate in opposite directions and to this end the teeth of the gears for the opposite rails G of the way are respectively of right and left handed worm formation and the two corresponding worms have their spiral convolutions oppositely pitched.

In order to take up the thrust of the worms L, I provide a thrust bearing N which is confined within the walls of the casing or gear boxes O at diametrically opposite ex-

tremities of the motor *m*. The gear boxes O comprise the side plates or cheeks P carrying the lugs V. The side plates or cheeks P are united by juxtaposed flanges R which are secured in a well known manner by bolts *w*. Carried within the lugs V are a pair of inclined rollers S having an integral stem or spindle T and a thrust bearing U. These rollers are maintained in their position by cap-screwed covers V′ which are secured to their respective lugs V. The disposition of the rollers S is such that they bear against and track along the underside of the heads H of the respective rails G at opposite sides of the way of the elevator shaft and maintain during the transit of the elevator car positive engagement of the rack formed in the tread H of the rail, and the worm wheels K.

In order to maintain a rigid brace for the gear boxes O at opposite extremities of the motor shaft, I provide a brace W which has an integral platform W′. The brace W is secured by its opposite extremities to the flanges R of the gear cases O respectively by bolts *w* and the platform W′ is secured to the base of the motor *m*. The upper edges of the gear cases O are provided with laterally extended flanges P′ whereby they are secured by bolts P^2 to the platform or sill B of the elevator car. The floor or sill B of the car is provided with a pocket or trap door *b* to render access to the handhole *b*′ of the motor *m*. The motor *m* is controlled by a controller 1^B which is electrically connected with controller leads *e* and *f*, electrically connected with the switch block or board *d*, motor leads *g* and *h* passing through the bushings g^2 and *g*′ respectively, and the feed wires, which are connected with the source of electrical supply for operating the elevator are connected up in the usual manner by a flexible cord when the conditions will permit, with coupling wires *e*′ and *f*′ carried by the switch block *d*.

When the height of the elevator shaft does not permit of carrying the requisite length of cable without undue strain, I provide a slotted conduit and sliding contact system therein, consisting of a boxing or conduit F^2 which extends along one of the ways E for approximately the height of the shaft presenting along the front surface a central longitudinal slot within which are channel conductors e^3 and f^3 which are electrically connected with the source of electrical supply by means of the connected binding posts e^2 and f^2 respectively. Within the trough or casing F^2 is a sliding shoe comprising the spring conductors e^4 and f^4 which are held insulated from each other within an insulated plow *j*, and is secured to a cover plate F^3. The cover plate F^3 is of a length approximately the height of that of the car A and covers the slot sufficiently to prevent accidental electrical contact between any material which might be carried by the car or to otherwise protect the duct or conduit F^2 against refuse entering the slot from the car.

In making electrical connection between the spring conductors e^4 and f^4, the cable connections *e*′ and *f*′ are electrically connected with the conductors f^4 and e^4 of the shoe and the plow *j* is bolted or otherwise secured to the flange R of the gear case O.

Prior to starting the elevator into action, it being assumed that the motor *m* is in electrical communication with a suitable source of electrical supply, the gear boxes O are provided with a supply of grease or heavy lubricating oil which is preferably introduced at the top so as to cover the worms L and the refuse is permitted to trickle into the teeth or rack of the rails G thereby providing a sort of grease circulation for the worms L, the gears K and their axles *k* as well as the rack, and the thrust bearings N if desired may be independently lubricated or may receive a supply of grease from the revolving screws L when they are revolving in a direction to propel the grease toward the thrust bearings and force the same through the adjacent bearing of the shafts of the worms L in their respective oppositely situated gear cases. A supply of grease may also be maintained within the caps V′ for the shafts T and thrust bearing U of the rollers S. To start the elevator A into operation, the controller 1^B is turned as in operating a railroad motor so as to turn the electrical energy into the motor *m*, whereupon the motor will rotate in a direction to correspond with the operation of the controller 1^B, either for raising or lowering according to the will of the operator whereupon the worms L will be set into rotation revolving the worm gears K while in contact with the racks of the rails G and thereby forcing the car A either up or down the elevator shaft according to whether the motor is rotating right or left handedly, and while the car A is progressing the guide rollers S bearing against the underside of the heads H of the rails G will maintain the proper depth relation of the teeth of the rails G at least in so far as spreading is concerned.

It is obvious that in the construction of my improved elevator, I may employ a double track of rails G on opposite sides of the elevator shaft or even a triple track depending upon the conditions of the load to which the elevator car A is subjected, or to the proportion of the width to that of the height of the said car and to this end, I may adopt a corresponding system of gear carried by the gear shafts *k* or a plurality of motors *m*, driving independent gears K through worms L. It will be well understood by my construction that when the elevator is stopped at any point, it will remain

at rest and be locked in position by virtue of the inability of the gears K to revolve since they are locked by the worms L as will be clearly understood by those familiar with worm gears, and it is therefore obvious that my improved elevator construction presents a safety device which obviates the hazard of falling which is occasioned by the breaking of cables in the usual types of elevators in vogue.

I am aware that previous to my invention elevators have been in vogue operated by a worm gear and I do not therefore claim these broadly as my invention, and

Having fully described my invention, I claim as new and desire to secure by Letters Patent of the United States.

1. In an elevator system of the character described, a shaft, a track within the shaft, comprising oppositely situated rails, said rails provided with flanges respectively, and intermediate web and tread surfaces for each, the tread surfaces of each being provided with spirally formed gearing teeth, said rails having inclined internal edges disposed as tread surfaces, a car playing within the shaft, a motor, a casing for the motor, spiral gearing carried by the casing adapted to engage the spiral teeth of the said rails and worm gearing carried by the casing and driven by the motor adapted to engage the said spiral gearing, covers for the casing and rollers carried by the casing and embraced by the covers adapted to engage the lateral margins of the rails at opposite sides of the shaft.

2. In an elevator system of the character described, an elevator shaft, a pair of toothed tee rails carried by the shaft and secured thereto, an electrical conduit within the shaft, a car suspended within the shaft, an electric motor carried by the car and adapted to make electrical contact with the aforesaid conduit, a casing for the motor, worm gears carried in the casing and adapted to engage the tee rails, worms driven by the motor engaging the worm gears, rollers provided with spindles carried by the casing adapted to engage the tee rails laterally and convergingly under the rack surface thereof and covers for the casing embracing the spindles of the said rollers in bearing relation, substantially as described.

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

BARNETT EPSTEIN.

Witnesses:
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