Nov. 18, 1924.

1,516,177

W. EDWARDS

SAFETY DEVICE FOR ELEVATORS

Filed July 3, 1922

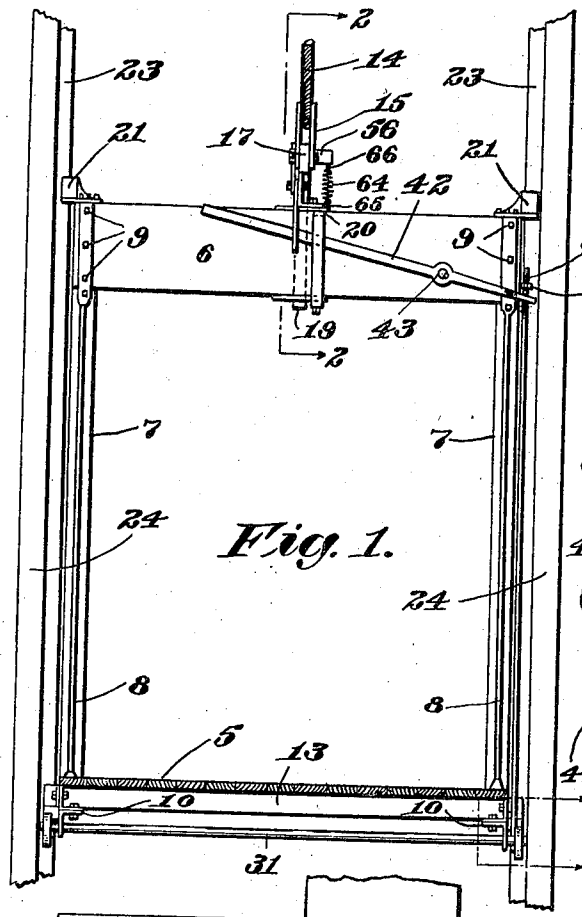

Fig. 1.

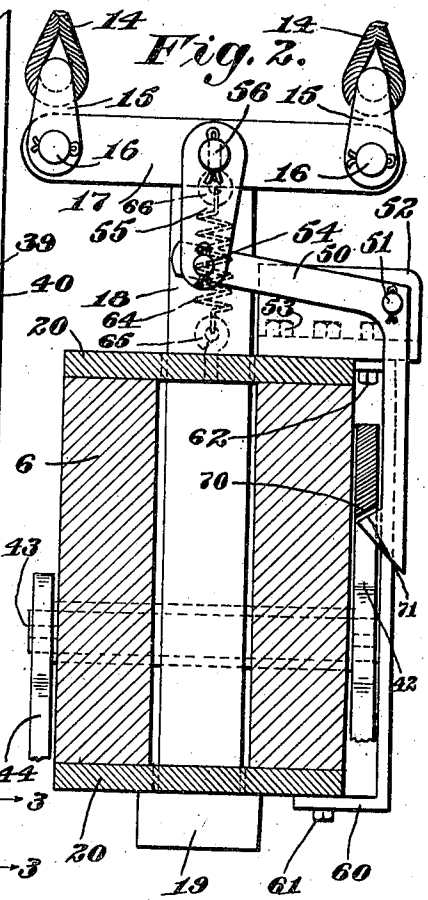

Fig. 2.

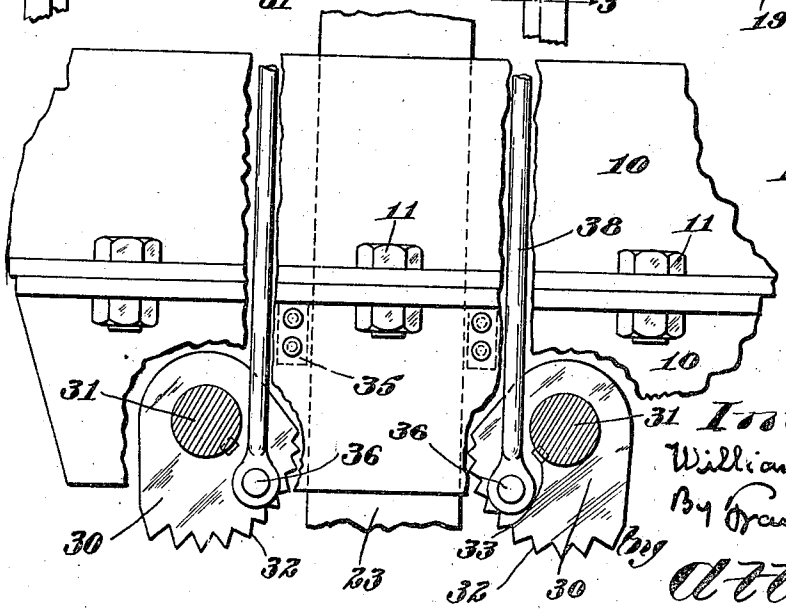

Fig. 3.

Inventors
William Edwards
By Francis J. V. Dalton
Attorney

Patented Nov. 18, 1924. 1,516,177

UNITED STATES PATENT OFFICE.

WILLIAM EDWARDS, OF WEST ROXBURY, MASSACHUSETTS.

SAFETY DEVICE FOR ELEVATORS.

Application filed July 3, 1922. Serial No. 572,456.

To all whom it may concern:

Be it known that I, WILLIAM EDWARDS, a subject of the United Kingdom of Great Britain and Ireland, residing at West Roxbury, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Safety Devices for Elevators, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to a safety device for elevators to prevent the dropping thereof in case the hoisting cable slackens or breaks, and is designed with special reference to low speed elevators.

The main object of the invention is the provision of a safety device of the character described, which is simple in construction and positive and efficient in its operation.

Another object is the provision of a device so constructed that after it has been operated, it can not be returned to an inoperative position until the hoisting cable has been restored to normal condition and the elevator raised.

Other objects of the invention will be more specifically set forth and described hereinafter.

In the accompanying drawings illustrating the preferred embodiment of my invention, Fig. 1 is a front elevation of a freight elevator of ordinary construction, having a safety device constructed and operated in accordance with my invention applied thereto; Fig. 2 is a cross-sectional view on an enlarged scale on line 2—2 in Fig. 1, looking from left to right; and Fig. 3 is a view on an enlarged scale on line 3—3 in Fig. 1, looking from left to right, portions being broken away to show the cams.

Referring to Fig. 1 of the drawings, there is shown a freight elevator of ordinary construction comprising a floor 5 and a crosshead 6 connected together by uprights 7 at the sides, reinforced by rods 8 extending obliquely from the floor edges to the crosshead and secured to the latter by bolts 9. The floor is supported by a suitable frame work made up of side beams, each made up of two angle iron pieces 10 secured together by bolts 11 and nuts 12, which side beams are connected together by a cross-beam 13.

The elevator is raised and lowered by two cables 14, each secured to a yoke 15, and the two yokes are connected by pins 16, one to each end of an evener bar 17, which in turn is centrally and pivotally connected to a drawbar 18 which passes loosely through the cross-head 6 and is, on its lower end, provided with a head 19 to prevent withdrawal. Plates 20 may be arranged on the top and bottom surfaces of the cross-head 6 to prevent wear. On the sides of the elevator at convenient points, suitable U-shaped guides 21 are provided for engaging vertical guide rails 23 carried by vertical supports 24. All of the foregoing construction is old and well-known, and is shown merely to illustrate the application of my invention without intending to limit that application to any particular form of elevator.

The novel features of my invention reside in a safety device comprising means adapted for gripping the guide rail to stop the elevator, said means being normally out of operation by gravity, and means controlled by the hoisting cable for throwing the gripping means into operation whenever the cable slackens or breaks.

Any suitable form of gripping means may be provided, and one such form is shown in the drawings, comprising one or more pairs of cams 30 (Fig. 3), eccentrically mounted adjacent the guide rail 23. Preferably two pairs are employed, one for each of the guide rails, each pair being so arranged that the guide rail is gripped between the two cams. The corresponding cams of the two pairs may be secured on rods 31 by keys 33, so that they may be operated in unison, the rods being loosely mounted in the side angle irons 10. Each cam is provided with a toothed segment 32 of gradually increasing radius, and in such close proximity to the guide rail that, when the cam is turned upwardly, the toothed segment bites into the guide rail to an increasing extent. Stops 35, fastened to an angle plate 10, may be provided to limit the upward movement of the cams 30. For operating the cams, each cam of the pair on the right, referring to Fig. 1, is fastened by a pin 36 located near the toothed segment to a rod 38 extending upwardly along the side of the elevator, the upper end of the rod being threaded at 39 and provided with a nut 40 thereon. A lever 42 is mounted eccentrically on a pin 43, passing loosely through the cross-head 6, and the short arm of the lever is provided at its end with an opening adapted to re-

ceive loosely one of the rods 38. On the reverse side of the cross-head, a short lever 44, corresponding in length to the short arm of the lever 42, is fastened on the pin 43, and the end of the lever 44 is provided with a similar opening to receive the other of the two rods 38. The movement of the lever 42 on its fulcrum 43 raises the two rods 38 or permits them to drop, and thereby rotates the cams into gripping position or away from gripping position, as the case may be. The long arm of the lever 42 should be of sufficient weight and length to normally raise the two rods 38 and the cams into full gripping engagement with guide rail, and, where two pairs of cams are employed, to operate the other pair of cams likewise.

It will be observed that the normal position of the lever 42 is with the long arm in a lowermost position, thereby raising the cams into gripping position; and in order to bring about this contingency whenever the elevator cable slackens or breaks, any suitable means may be provided for holding the long arm of the lever 42 in an uppermost position so long as the cable is taut and for releasing it when the cable slackens or breaks. One means is shown in the drawings, and comprises an L-shaped latch 50, pivotally mounted on a pin 51 set in a bracket 52 secured by bolts 53 to the upper plate 20. The rear end of the latch is connected by a pin 54 to a link 55 connected by a pin 56 to the evener bar 17; these parts being of such proportions that when the cable is taut and the evener bar is held up, the latch is in the position shown in Fig. 2, thereby locking the lever 42 in position with its long arm uppermost. A retaining band 60, secured by bolts 61 and 62 to the bottom plate 20 and the bracket 52, respectively, may be provided for preventing any lateral movement of the lever 42.

In order to secure a quick release of the lever 42 from the latch 50 when the hoisting cable either slackens or breaks, any suitable means may be provided for accelerating the movement of the drawbar 18 downwardly in relation to the cross-head 6, and one such means is shown in the drawing, consisting of a spring 64 under tension when the parts are in their normal position; the lower end of said spring being connected to an eye bolt 65 set in the upper plate 20, and the upper end of the spring being connected to an eye bolt set in the rear end of the pin 56. The spring 64, being under tension at all times, immediately causes a quick dropping of the evener bar when there is a slackness or breaking of the hoisting cables 14, thereby immediately releasing the lever 42 and causing the cams to bite into the guide rails before the car has acquired any headway in its drop. The rapidity of the release of the lever 42 by the latch 50 may be increased by bevelling the lower edge of the lever 42 at 70, and by correspondingly bevelling the inner edge of the nose of the latch at 71, so that the force of gravity exerted upon the lever 42 tends of itself to push the latch outwardly and disengage itself. This greatly reduces the strain upon the safety mechanism and upon the car by stopping its drop at the earliest possible moment.

The operation of my safety device is extremely simple and is as follows.

Normally the various parts are in the positions shown in the drawings, the lever 42 being held in its inoperative position by the latch 50, and the cams 30 being in outward engagement with the guide rails and held in a lowermost position by the force of gravity. While the cams being eccentrically mounted tend naturally to assume the position shown in Fig. 3, the weight of the rods 38 insures the retention of the cams in such position until the safety device is operated. After the lever has been locked in position by the latch 50, it can not be released, so long as the hoisting cable remains taut, without lifting the entire weight of the car in order to drop the evener bar in relation to the cross-head.

If for any reason the hoisting cables 14 break or become slack, the drawbar 18, which is loosely mounted in the cross-head 6, immediately drops through the force of gravity, thereby throwing out the nose of the latch 50 and releasing the lever 42. The long arm of the lever then drops, and the short arm and arm 44 move upwardly, engaging the nuts 40 on the rods 38, raising the rods, and thereby turning the cams 30 into engagement with the guide rail or guide rails, as the case may be. The natural dropping of the elevator car when the hoisting cable slackens or breaks will cause the cams 30 to continue their turning movement until they engage the stops 35, the cams as they turn biting further into the guide rails, generally made of wood or similar substance, whereby the car is stopped.

In order to release the car from this position assuming that the cable is returned to a taut condition or repaired in case of breakage, the lever 42 must be returned into engagement with the latch 50 after which the car is moved upwardly which automatically turns the cams 30 back into normal, inoperative position. If, however, there is any question about the strength of the cable after the car has been stopped, the lever 42 may be allowed to remain unlatched and the elevator car moved upwardly, in which case the cams will disengage from the guide rails and drag along the same, ready at any moment, when the hoisting cable slackens or breaks, to again engage the guide rail and stop the car in its downward movement.

It will be observed that my safety device is of extreme simplicity, and is positive in its action at all times.

By providing means for drawing the drawbar downwardly in relation to the cross-head of the elevator in order to release the latch when the strain on the hoisting cable permits, I take care of all contingencies. For example: cases have been known where the drum upon which the hoisting cable is wound has been suddenly released, owing to the fact that the operating worm gear has been stripped due to wear, in which case the elevator has simply dropped rapidly without slackening the cable sufficiently to throw the safety device into operation. In my device, however, such a contingency would be taken care of by the spring connecting the cross-head with the pin in the evener bar, thereby drawing the two members together and releasing the latch independly of any slackening of the hoisting cable. The spring in this instance is sufficiently strong to bring about this action, if the hoisting drum is released, so that the hoisting cable is played out without restriction.

Other advantages of my construction are that the parts are open to inspection at all times, thereby making it possible to detect any defects which may be due to wear or tear, and that the device may be tested without the use of a knockout stick. In many States the laws require an annual inspection and testing of elevators and safety devices thereon. In elevators of this class it is usually customary, in testing the safety device, to have a man go under the elevator, insert a knockout stick upon which the elevator is lowered and the hoisting cable run out until there are a number of feet of slack cable, when the knockout stick is pushed out and the elevator allowed to drop. This operation involves more or less danger to the man under the car, for the reasons that, if the stick is not sufficiently strong to support the elevator or slips away, the elevator is liable to drop and injure the man underneath. With my device the presence of a man under the elevator is entirely unnecessary, because a barrel, box, or any similar article, may be placed under the elevator which is then lowered onto the box or barrel sufficiently to slacken the cable to release the latch, after which the elevator may be raised, dragging the cams on the guide rail as heretofore explained, and then lowering to see if the cams catch and hold the car. Such a test demonstrates fully the operation of the safety device without endangering any lives or exposing anyone to injury.

It is to be understood that my invention is not to be restricted to the particular embodiment herein shown and described, since it may be exemplified in various other forms of construction, and I desire to claim it broadly except where specifically limited in the following claims.

What I claim is:

1. The combination with an elevator car of a pair of normally inoperative cams for engaging the guide rail to stop the car, a gravity-operated lever for throwing said cams into operation, and a latch for holding said gravity-operated lever in a raised, inoperative position; said latch being arranged to release said gravity-operated lever whenever the hoisting cable becomes slack or breaks.

2. The combination with an elevator car of a pair of normally inoperative cams for engaging the guide rail to stop the car, a gravity-operated lever for throwing said cams into operation, and a latch for locking said gravity-operated lever in a raised position; said latch being so arranged that the slackening of the hoisting cable releases said gravity-operated lever.

3. The combination with an elevator car of normally inoperative means for engaging the guide rail to stop the car, a gravity-operated lever for throwing said engaging means into operation, and a latch for locking said gravity-operated lever in a raised position; said latch being so arranged that the slackening of the hoisting cable releases said gravity-operated lever.

4. The combination with an elevator car of a pair of cams for engaging the guide rail to stop the car, said cams being held normally in an inoperative position by gravity, a lever fulcrumed eccentrically on the cross-head of the elevator, the short arm of said lever being connected to said cams, means for holding the long arm of said lever in a raised position, and means for automatically releasing said holding means whenever the hoisting cable slackens or breaks.

5. The combination with an elevator car of a pair of cams for engaging the guide rail to stop the car, said cams being held normally in an inoperative position by gravity, a lever fulcrumed eccentrically on the cross-head of the elevator, the short arm of said lever being connected to said cams and the long arm of said lever being of sufficient weight to raise said cams into operative position, and a latch for holding said long arm of said lever in a raised position; said latch being automatically released whenever the hoisting cable slackens or breaks.

6. The combination with an elevator car of means for engaging the guide rail to stop the car, a lever fulcrumed eccentrically on said car, the short arm of said lever being connected to said means and the long arm being of sufficient weight to raise said short arm to throw said engaging means into operation, and a latch for holding said

long arm of said lever in a raised position; said latch being so arranged that said lever is released therefrom whenever the hoisting cable slackens or breaks.

7. The combination with an elevator car of a pair of normally inoperative cams for engaging the guide rail to stop the car, a lever fulcrumed eccentrically on said car, the short arm of said lever being connected to said cams and the long arm being of sufficient weight when released to raise said short arm to throw said cams into operation and a latch for holding said long arm of said lever in a raised position; said latch being so arranged that said lever is released therefrom whenever the hoisting cable slackens or breaks.

In witness whereof, I hereunto set my hand this thirtieth day of June, 1922.

WILLIAM EDWARDS.