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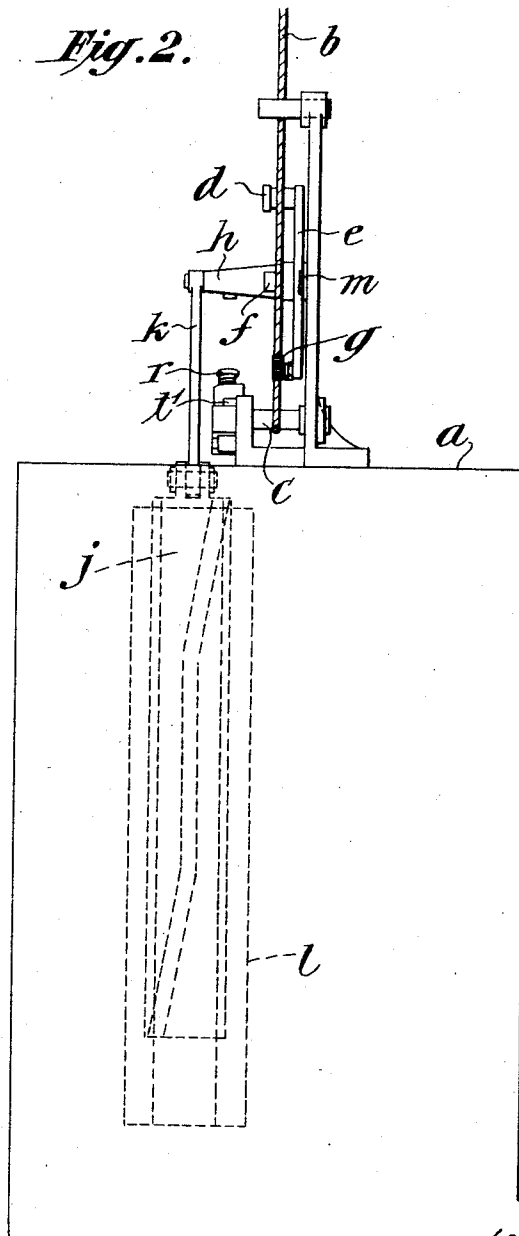
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J. MAIR

STOPPING DEVICE FOR ELECTRIC LIFTS

Filed Dec. 16, 1926

4 Sheets-Sheet 2



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By *Stewart & Co.* Attys.

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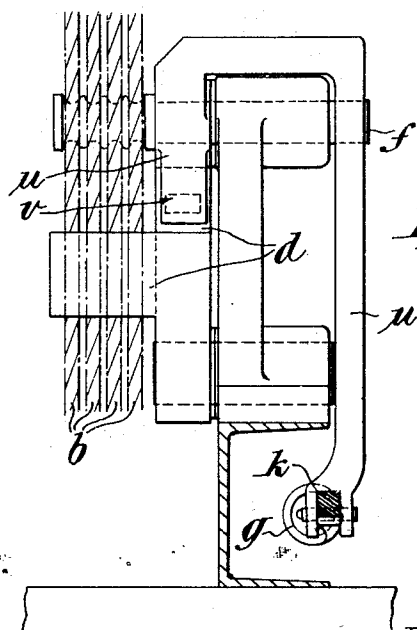
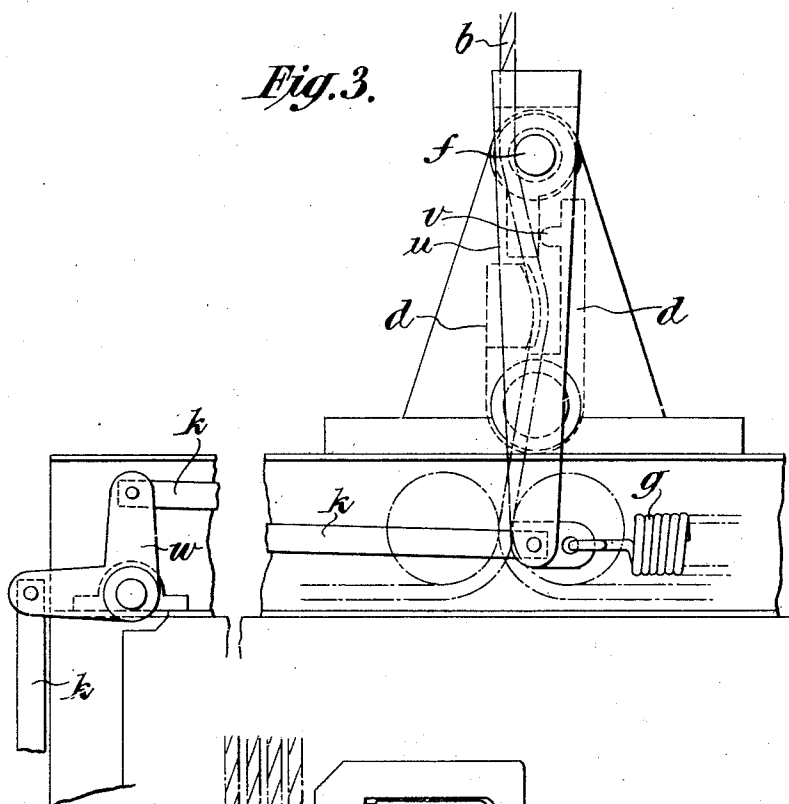
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STOPPING DEVICE FOR ELECTRIC LIFTS

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4 Sheets-Sheet 3



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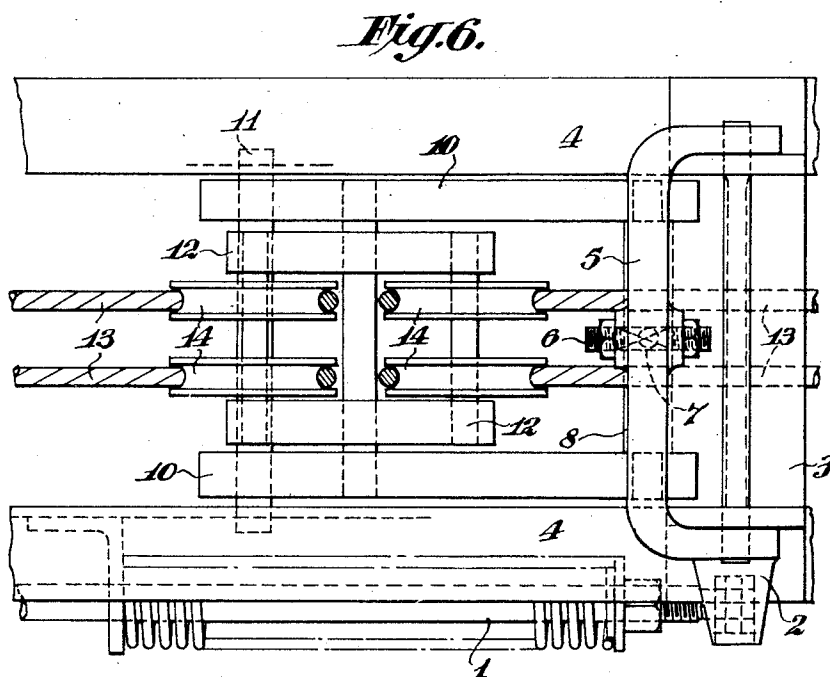
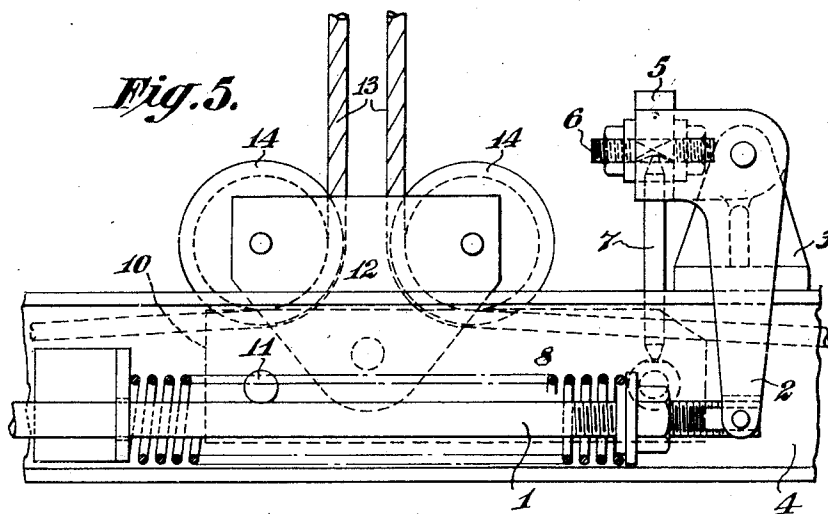
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STOPPING DEVICE FOR ELECTRIC LIFTS

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE.

JAMES MAIR, OF NEWCASTLE-UPON-TYNE, ENGLAND.

STOPPING DEVICE FOR ELECTRIC LIFTS.

Application filed December 16, 1926, Serial No. 155,315, and in Great Britain May 14, 1926.

This invention has reference to improvements in and relating to stopping devices for electric lifts, of the type wherein the stopping of the lift is effected by the use of a cam board or equivalent on the cage adapted to "strike" or operate a switching device suitably positioned in the lift well or shaft. The cage is allowed a certain estimated stopping distance in which to come to rest after the cam board has struck its switch. The actual stopping distance of the cage, however, is largely dependent upon the momentum of the loaded cage, which momentum is governed by the load in the cage. Hence the estimated stopping distance is equal to the actual stopping distance for one particular load only. A heavily loaded cage, for example, stops below the floor level, since the momentum is greater and thereby permits the cage to coast a greater distance than it would with a light load, were the current turned off at the same time in both instances due to the fact that in the usual elevator installation, the counter-weights are made equal in weight to the weight of the car plus 40% of its rated load.

The object of my invention is to provide a mechanical device which automatically adjusts the position of the cam board or the equivalent with respect to the switches in the lift shaft with which the cam board co-operates, according to the load carried by the cage. Means to prevent the starting of an overloaded cage are provided. The device in accordance with my invention is so arranged that the cam board of a cage when heavily loaded strikes its floor switch sooner when descending and later when ascending than it would if lightly loaded, that is, the estimated stopping distance is automatically adjusted to agree with the actual stopping distance necessitated by the variation in the load carried. The cage therefore stops accurately where required irrespective of the load therein.

Broadly, according to the said invention, the cam board is vertically adjustable on the cage, the adjustment being automatically effected by means influenced by the variation of load.

In order that the invention may be readily understood reference is directed to the accompanying sheet of drawings, wherein:—

Figure 1 is a front view of the device in accordance with this invention; and,

Figure 2 is an end view thereof, looking in the direction of arrow A, Figure 1.

Figure 3 is a front view of a modified form of mechanism; and,

Figure 4 is a side view thereof, looking in the direction at right angles to Figure 3.

Figures 5, 6 and 7 are front elevation, plan and end view, respectively, of a modification.

Referring to the drawings, the cage *a* is supported by a rope *b*, anchored at *c*. The rope *b* is deflected by the pressure pin *d* on the crank arm *e*, pivoted at *f*, the pressure upon the rope being maintained by a spring *g*, so that the lighter the load in the cage the greater the deflection of the rope. As the load increases, the rope *b* tends to straighten and in so doing rotates the crank arm *e* about its pivot *f*. This movement is transmitted to another arm *h* which in turn vertically adjusts the cam board *j*, through suitable linkage *k*. The cam board *j* is preferably slidably mounted in a guideway *l*.

A pointer *m* may be provided, the movement of which is an indication of the load in the cage *a*. The pointer *m* may therefore directly indicate the load of the cage contents upon a dial or plate *n*, or, if preferred, the movement of the pointer *m* may be transmitted by suitable controls *p* to an indicator (not shown) within the cage.

The dotted outline in Figure 1 indicates the position of the mechanism and the cam board when the cage is fully loaded. Any appreciable increase in the load beyond the normal full load causes the arm *n* to drop still lower until it comes into contact with the spring-controlled plunger *r*. Depression of the plunger *r* forces the bridge member *s* away from the contacts *t*, *t'*, which are in the control circuit of the lift. In this way an overloaded cage automatically cuts off the power necessary for starting and travelling, so that until the load in the cage is reduced, it is impossible for the cage to move. Any other cut-out switch may be operated by the arm *h*.

Figures 3 and 4 illustrate a modified form of operating mechanism, especially, but not exclusively, applicable for use with cages supported by a plurality of ropes or cables. Under the action of the spring *g* the rocker arm *u*, rotating about the pivot *f*, bears against a peg or projection *v* upon a separately pivoted pressure member *d* pivoted at substantially right angles to the rope *b* there-

by forcibly deflecting the same. As the ropes 6 tend to straighten under the increase of load in the cage, the pressure member *d* moves the rocker arm *u* which, through linkage *h*, including a bellcrank *w*, operates the cam board as and for the purposes previously described. The peg or projection *v* of the pressure member *d* may be vertically adjustable.

Load recording means and an overload stopping device are not shown in Figures 3 and 4.

Referring to Figures 5 to 7, a spring-controlled rod 1, which may be connected at one end to the cam board, via suitable intermediary linkage, is pivotally connected at the other end with a rocker or cranked member 2, which in turn is pivotally mounted upon a bracket 3 secured to the top beam 4 of the cage. To the bridge-like portion 5 of the cranked member 2 is attached an adjustable bearing member 6 adapted to receive the upper extremity of a pointed pressure pin 7. The lower extremity of the pointed pressure pin 7 rests in a recess in another bearing 8 which spans a pair of levers 10, pivoted at 11. A pulley or roller carrier 12 is positioned above and pivotally connected to the levers 10, connection being made between the pivot pin 11 and bearing pin 8, at a position such that a slight upward movement of the carrier 12 produces a relatively large upward movement of the bearing pin 8 and consequently of the pressure pin 7. The hoisting cables 13 pass down between and under the pairs of pulleys or rollers 14, the number of cables to right and to left being equal in number so that their respective forces are balanced and neutralized. The cables are anchored in any suitable known manner.

As the cables 13 tend to straighten out under the application of increasing loads within the cage, the carrier 12 rises with respect to the top beam 4 of the cage. The upward movement of the carrier 12 tilts the lever 10, causing the pressure pin 7 to swing the cranked member 2 about its pivot. The cranked member 2 is thereby caused to operate the rod 1 against the action of its spring so that by means of suitable linkage the cam board is lowered. The spring-controlled rod 1 re-sets the mechanism as the load is decreased.

I claim:

1. A stopping device for electric lifts of the type employing a cam board or equivalent floor limit switch-operating device on the cage, in combination with a cage, a hoisting cable therefor, a cam board mechanically connected with said cable, and means for forcibly deflecting the cable out of a straight line subject to the variations of loads in said cage whereby said cam board will be automatically adjusted for the purposes specified.

2. A stopping device for electric lifts of the type employing a cam board or equivalent floor limit switch-operating device on the cage, in combination with a cage, a hoisting cable therefor, a cam board mechanically connected with said cable, and resiliently tensioned means for forcibly deflecting the cable out of a straight line subject to the variations of loads in said cage whereby said cam board will be automatically adjusted for the purposes specified.

In testimony whereof I have affixed my signature hereto this 23rd day of November, 1926.

JAMES MAIR.