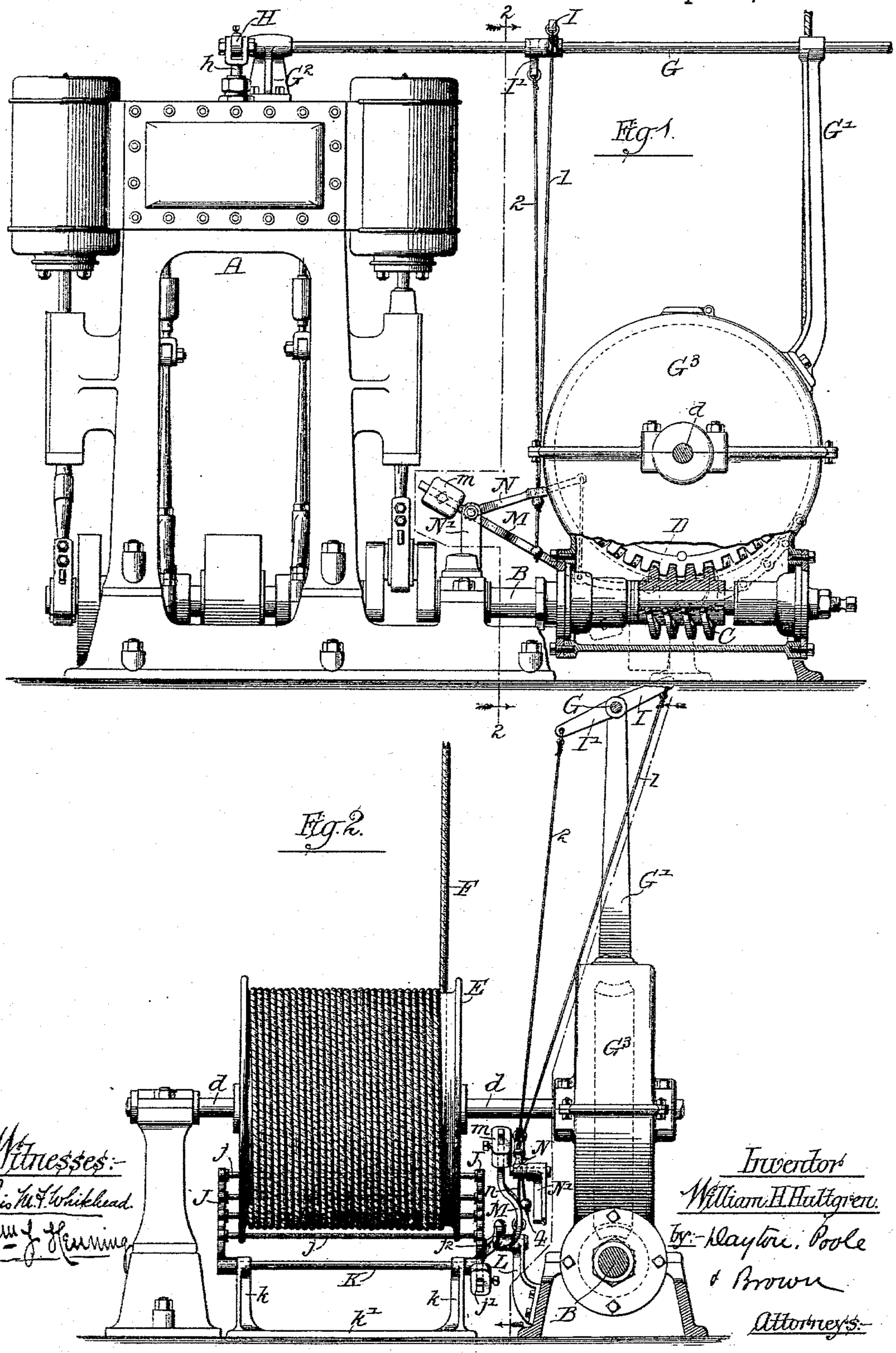
(No Model.) 2 Sheets—Sheet 1.

# W. H. HULTGREN.

## AUTOMATIC SLACK CABLE STOP FOR ELEVATORS.

No. 494,810. Patented Apr. 4, 1893.

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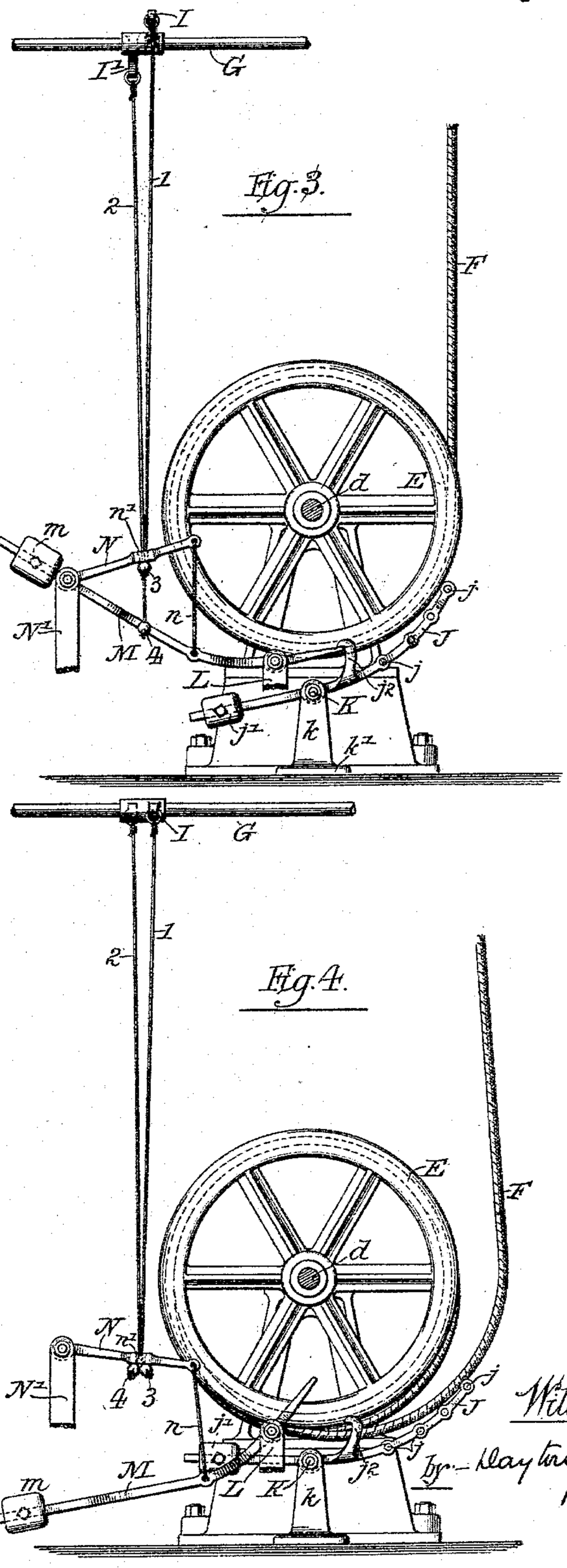


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# UNITED STATES PATENT OFFICE.

WILLIAM H. HULTGREN, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO ALBERT B. ELLITHORPE, OF SAME PLACE.

## AUTOMATIC SLACK-CABLE STOP FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 494,810, dated April 4, 1893.

Application filed December 29, 1890. Serial No. 376,070. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM H. HULTGREN, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Automatic Slack-Cable Stops for Elevators; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to appliances for automatically stopping the action of the motors of passenger and other elevators (of that class having hoisting drums,) upon the occurrence of any accidental stoppage of the car, and the object of my present invention is to provide means for automatically and quickly stopping the motion of the engine or other actuating mechanism when the elevator car accidentally stops while descending; the weight of the slackened hoisting rope or ropes being the means for putting the stop-mechanism into operation.

To the above purpose my invention consists in certain peculiar and novel features of construction and arrangement as hereinafter described and claimed.

It occasionally happens in passenger and other elevators of the class referred to, that the elevator car becomes jammed or otherwise held in its guides while descending, and when this happens the hoisting rope or ropes continue to unwind from the drum, unless the engine or other operating power is stopped, and considerable slack rope is run off from the drum. If at this time the elevator car clears itself it will drop to a dangerous extent. If, however, the engine or other motor mechanism be stopped at the instant when the car is arrested in its descent but little slack rope will be unwound from the drum and consequently all liability of accident from the dropping of the car will be obviated.

In the accompanying drawings: Figure 1 is a front elevation of an engine operatively connected with a hoisting drum; a stop-mechanism embodying my invention being applied to the same. Fig. 2 is a side elevation of the hoisting drum, the crank-shaft and the valve-operating shaft being in transverse vertical section on the line 2—2 of Fig. 1. Fig. 3 is an end elevation of the hoisting drum, showing the stop mechanism in the position which it normally occupies when the elevator is in motion. Fig. 4 is a view similar to Fig. 3 but showing the stop mechanism in the position to which it is shifted to stop the engine.

Referring now to the drawings, A designates a hoisting-engine, which may be either of the particular type shown, or of any other kind, suitable for operating the winding drum of an elevator.

The crank-shaft B of the engine carries a worm C which meshes with the teeth of a worm-wheel D mounted on the shaft *d* of the winding-drum E. The usual hoisting rope F leads from the drum, and is suitably connected with the elevator car.

A rock-shaft G is shown as supported in bearings at the upper ends of two standards G′ $G^2$ rising vertically from the shield $G^3$ which surrounds the worm-wheel, and from the valve-chest of the engine, respectively, but said rock-shaft G may obviously be supported in hangers or otherwise as preferred. Said shaft G carries a rigid arm H which is connected at its outer end with the stem *h* of the throttle valve of the engine. At its opposite end the rock-shaft is designed to be connected with the usual controlling rope which is manipulated by the attendant in the elevator-car, and the arrangement is such that when the rock-shaft is partially rotated in one direction the valve will be opened and the engine will operate to rotate the winding-drum E, and when the rock-shaft is partially rotated in the opposite direction the valve will be closed and the engine will stop.

At a suitable point on the rock-shaft G are secured two oppositely extending rigid rock arms I I′. To the outer ends of said arms are connected two rods or wires 1, 2, which extend downward and are connected with other parts of the stop-mechanism, hereinafter explained.

J J designate two bars, which are pivoted upon a rock-shaft K journaled in the upper ends of two standards *k* rising vertically from a suitable base *k′*, below the winding-drum E. The bars J are parallel with each other and are each curved upwardly at its upper

end, as shown. These upwardly curved portions of the bars J are connected together so as to form a transverse rack or tilting-frame, and in the drawings this frame is shown as formed by a number of parallel bars or slats *j j* which extend from one bar J to the other. One or both of the opposite ends of bars J carry each a counter-balance weight *i'* which serve to hold the tilting-frame in its elevated position, shown in Figs. 1, 2 and 3, of the drawings.

Attached to one of the bars J at a point between its pivot and its upwardly curved end, is an upwardly extending detent or hook $j^2$, the purpose of which will be presently explained.

M designates a swinging lever which I term the "trip-lever," and which is pivoted upon the upper end of a support or standard L, shown (Fig. 2) as secured at its lower end to the base of the worm-shaft bearing. One end of the trip-lever M is located in position to engage the above described hook $j^2$ while its opposite end carries a weight *m*. In its normal position the lever M is engaged with the hook $j^2$ which holds the weighted end of the lever in its elevated position. Said hook $j^2$ together with the end or arm of the trip-lever engaged therewith constitute in effect a catch or separable holding device, which acts to normally retain the weighted end of the trip-lever elevated, but which releases the trip-lever when the tilting frame is moved or depressed. The said hook $j^2$ is made beveled or inclined on its outer or upper face, so that when the parts are disconnected, and the adjacent end of the trip lever is depressed, the latter will act upon the inclined surface of the hook and thus force the latter backward until the trip-lever again engages the hook. It will of course be seen that the hook or detent is allowed to yield or move at such time by the lifting of the counter-balance weight *j'*.

N designates a lever which is pivoted at one end upon the upper end of a standard or support N' which, as shown, stands back of and rises above the supports *k* and L before mentioned. The free end of lever N is connected by means of a rod *n*, with the trip-lever M, at a point between the pivot and weighted end of said lever.

At a point between its ends the lever N is provided with an eye or opening *n'* through which pass the lower portions of the rods or wires 1 and 2, the intention being to form a perfectly free sliding connection between the lever N and the lower portions of said rods or wires. At their lower ends the rods or wires 1, 2, are provided with knobs or heads 3, 4, respectively, which are at times engaged by the under side of the lever N for throwing the rock-shaft G, as hereinafter more fully described.

Assuming that the engine is working with the elevator car coming down, the parts of the stop-mechanism will occupy the relative positions shown in Figs. 1, 2 and 3, that is to say, the tilting-frame *j* will be held in its elevated position by the counterbalance weights *j'* on the arms J, the trip-lever M will be held in engagement at one end beneath the hook $j^2$, its weighted end being elevated, and the lever N will be at the upper limit of its throw with the knob or head 3 of the rod 1 in contact with or close to the under side of said lever N. At this time the rock-shaft G is perfectly free to move in either direction for shifting the controlling valve so as to move the elevator car either up or down, the rods or wires sliding in or through the lever N when the rock-shaft is moved, in an obvious manner. Let it be supposed that while descending the elevator car binds or becomes stuck in its ways, or, from any other accidental cause, comes to a stop. The engine will for an instant continue to unwind the rope or ropes F from the drum and the slack thus formed will sag down upon the rack *j*, as shown in Fig. 4. The weight of this slackened rope will overbalance the weighted ends of the bars J and will tilt the platform downward, as shown in Fig. 4. This tilting movement will move the hook $j^2$ out of engagement with the front end of trip-lever M and the weighted end of said lever will drop, pulling down on the rod *n* and depressing the free end of lever N. Said lever N, in its descent, will strike the knob or head 3 and pull down upon the rod 1, thus drawing the rock-arm I downward and giving a partial revolution to the rock-shaft G. This movement of rock-shaft G through the medium of rock-arm H, shifts the throttle-valve of the engine into its intermediate position or that for cutting off steam and stopping the engine. When the fault with the elevator-car has been remedied, the attendant moves the controlling rope to rotate the rock-shaft, and the throttle-valve will be opened to start the engine in the usual manner. The rotation of the rock-shaft G automatically resets the stop-mechanism in readiness for further operation, because either the rod 1 or 2 (according to whether the car is started upward or downward) will, through the action of the knob 3 or 4, as the case may be, pull the lever N upward and draw the forward end of trip-lever M downward into position in readiness for engagement with the hook $j^2$. Meanwhile the engine having wound up the slack, the platform *j* will have been automatically raised by the counterbalance weights *j'* and the hook $j^2$ will be raised into position to engage the trip-lever, and the parts will therefore resume the normal relative positions, as shown in Figs. 1, 2 and 3 automatically and without special attention on the part of the operator.

It is to be observed that the stop-mechanism operates equally well in the event of other accidents than that mentioned above. For example, let it be supposed that, while the elevator car is either ascending or descending, the rope or ropes F break; the falling rope will strike the platform and stop the engine,

and thus, particularly when the car is ascending, prevent racing of the engine and entanglement of the ropes with the hoisting machinery. It is also obvious that the stop mechanism may be readily applied to operate upon the valves of hydraulic elevators, either through the medium of the rock-shaft G or otherwise, as circumstances may require. It is entirely obvious, inasmuch as the levers M and N are moved in the same direction in the operation of the device, that by properly proportioning the parts, the rods or wires 1 and 2 may act directly upon the lever M instead of upon the lever N. It is further obvious that chains, cords, or other flexible connections may be substituted for the rods or wires 1 and 2,—the connections in either case being contractible, or capable of being shortened without disengagement or disconnection, so as to afford lost motion between the parts except when the safety device is brought into action. In case flexible connections are used, they may be permanently joined at their ends to the lever N, inasmuch as the flexing of one or the other of the flexible connections will render any sliding joints between said parts unnecessary. It is to be understood that a spring or springs may be substituted for either or any of the weights shown without departure from my invention.

I claim as my invention—

1. The combination with the hoisting rope and controlling mechanism of an elevator, of a weighted trip-lever having operative connection with the controlling mechanism, an independently movable tilting-frame located in position for actuation by the hoisting rope, and a catch or separable holding device actuated upon by the tilting-frame and acting to hold the said trip-lever normally out of action, substantially as described.

2. The combination with the hoisting rope and controlling mechanism of an elevator, of a weighted trip-lever having operative connection with the controlling mechanism, an independently movable tilting-frame located in position for actuation by the hoisting rope, said tilting-frame being provided with a counterbalance weight and a catch or separable holding device actuated by said tilting-frame and acting to hold the said trip-lever normally out of action, substantially as described.

3. The combination with the hoisting rope of an elevator and a controlling mechanism embracing a rock-shaft provided with rigid opposite arms, of a tilting frame located in position for actuation by the rope, a weighted trip-lever, connections between said trip-lever and each of said arms on the rock-shaft affording lost motion between said parts, and a catch or separable holding device actuated by the tilting frame and acting to hold the trip-lever normally out of action, substantially as described.

4. The combination with the hoisting rope and controlling mechanism of an elevator, of an independently movable tilting frame located in position for actuation by the rope and provided with a hook or detent, and a weighted trip-lever having operative connection with the controlling mechanism and provided with a part or arm adapted to engage said hook or detent, substantially as described.

5. The combination with the hoisting rope and controlling mechanism of an elevator, of an independently movable tilting frame located in position for actuation by the rope, and provided with a hook or detent, and also with a counterbalance weight, and a weighted trip-lever having operative connection with the controlling mechanism and provided with a part or arm adapted to engage said hook or detent, said hook or detent being inclined or beveled to allow automatic engagement of the parts, substantially as described.

6. The combination with the hoisting rope of an elevator, and a controlling mechanism embracing a rock-shaft provided with rigid opposite arms, of a tilting frame located in position for actuation by the rope and provided with a hook or detent, a weighted trip-lever having a part or arm adapted for engagement with said catch or detent, and connections between said trip lever and each of said arms, affording lost motion between said parts, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

WILLIAM H. HULTGREN.

Witnesses:
C. CLARENCE POOLE,
JOHN E. WILES.