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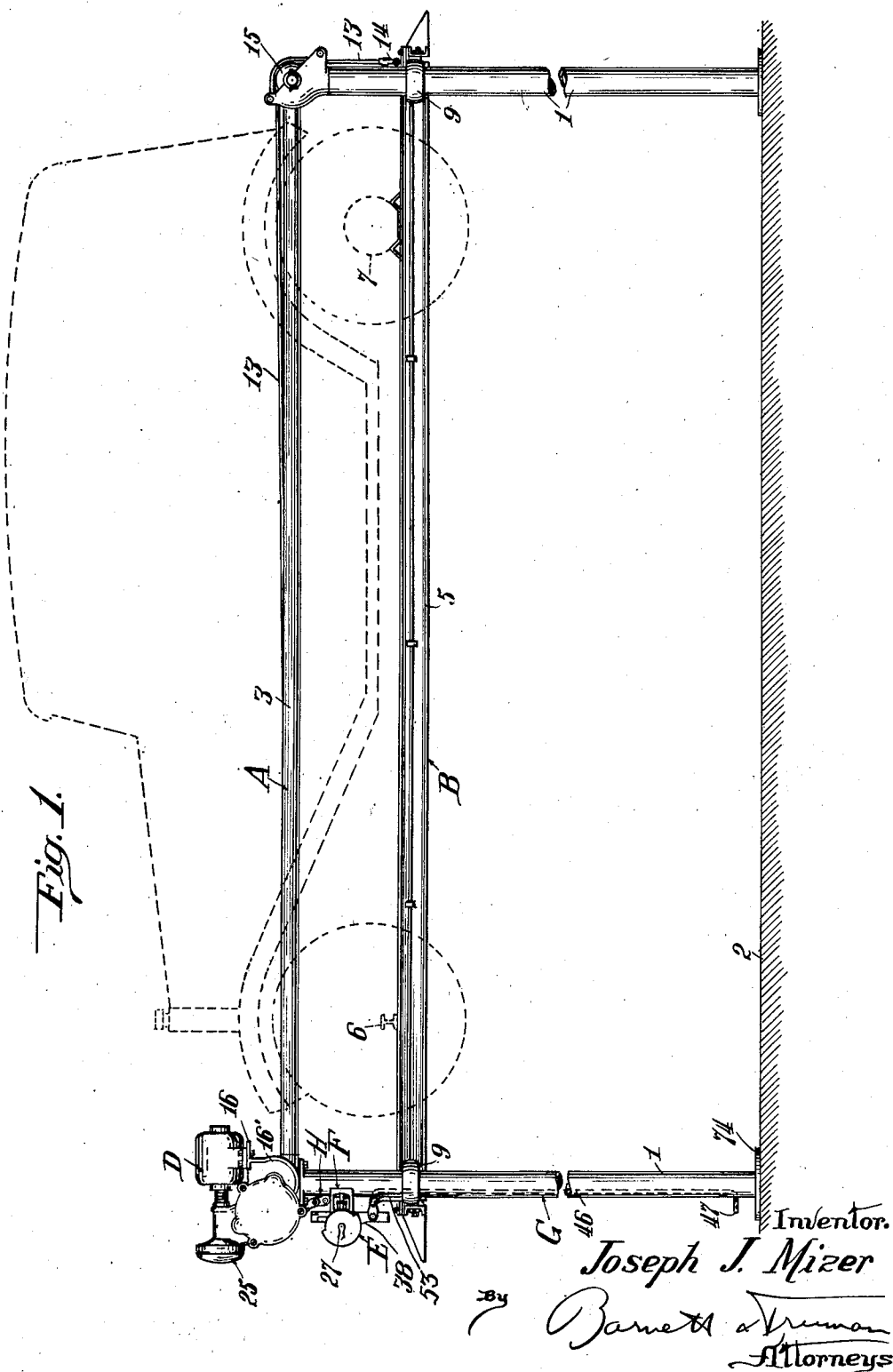
J. J. MIZER

1,990,241

SLACK CABLE STOP FOR HOISTS

Filed July 2, 1934

4 Sheets-Sheet 1



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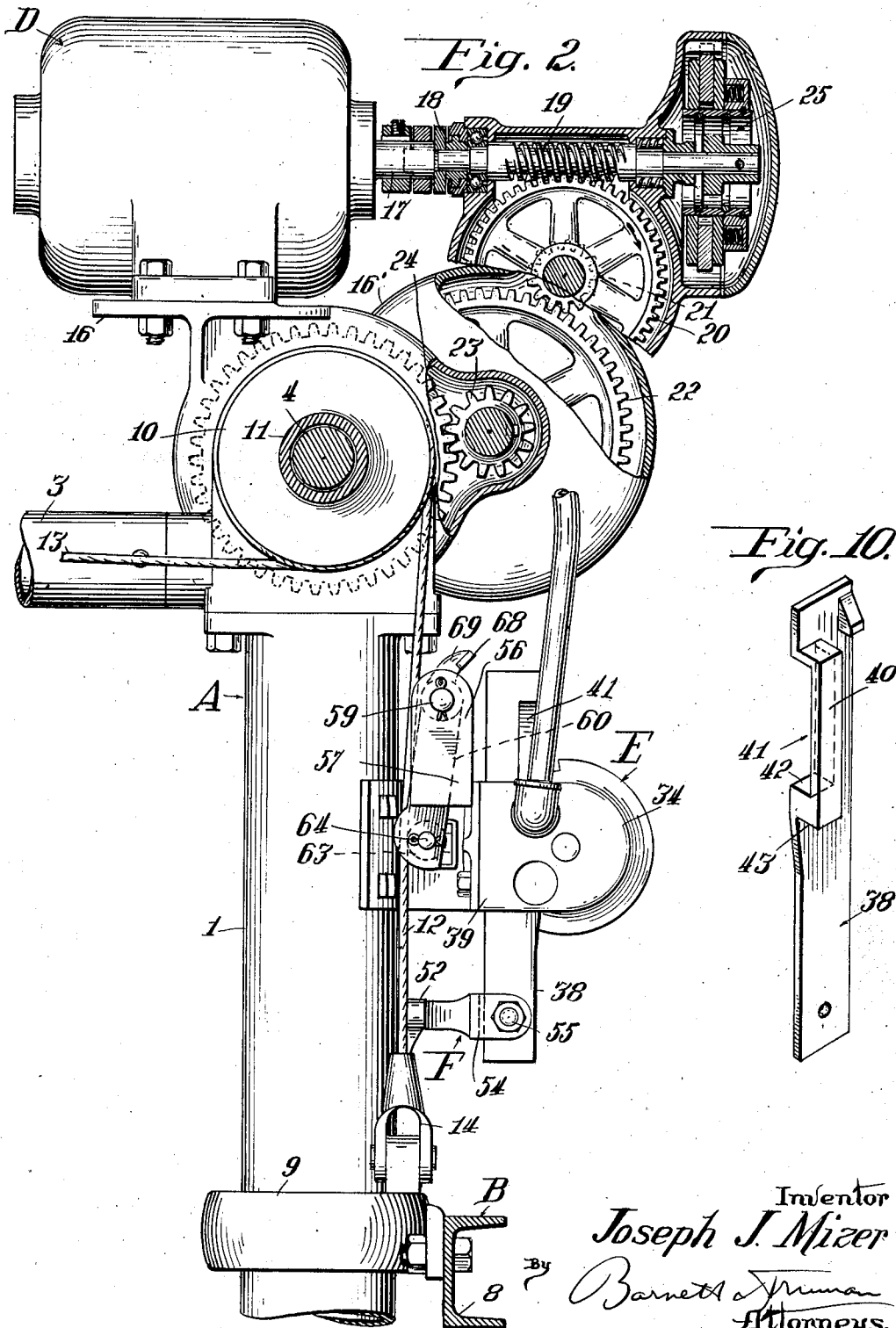
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SLACK CABLE STOP FOR HOISTS

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4 Sheets-Sheet 2



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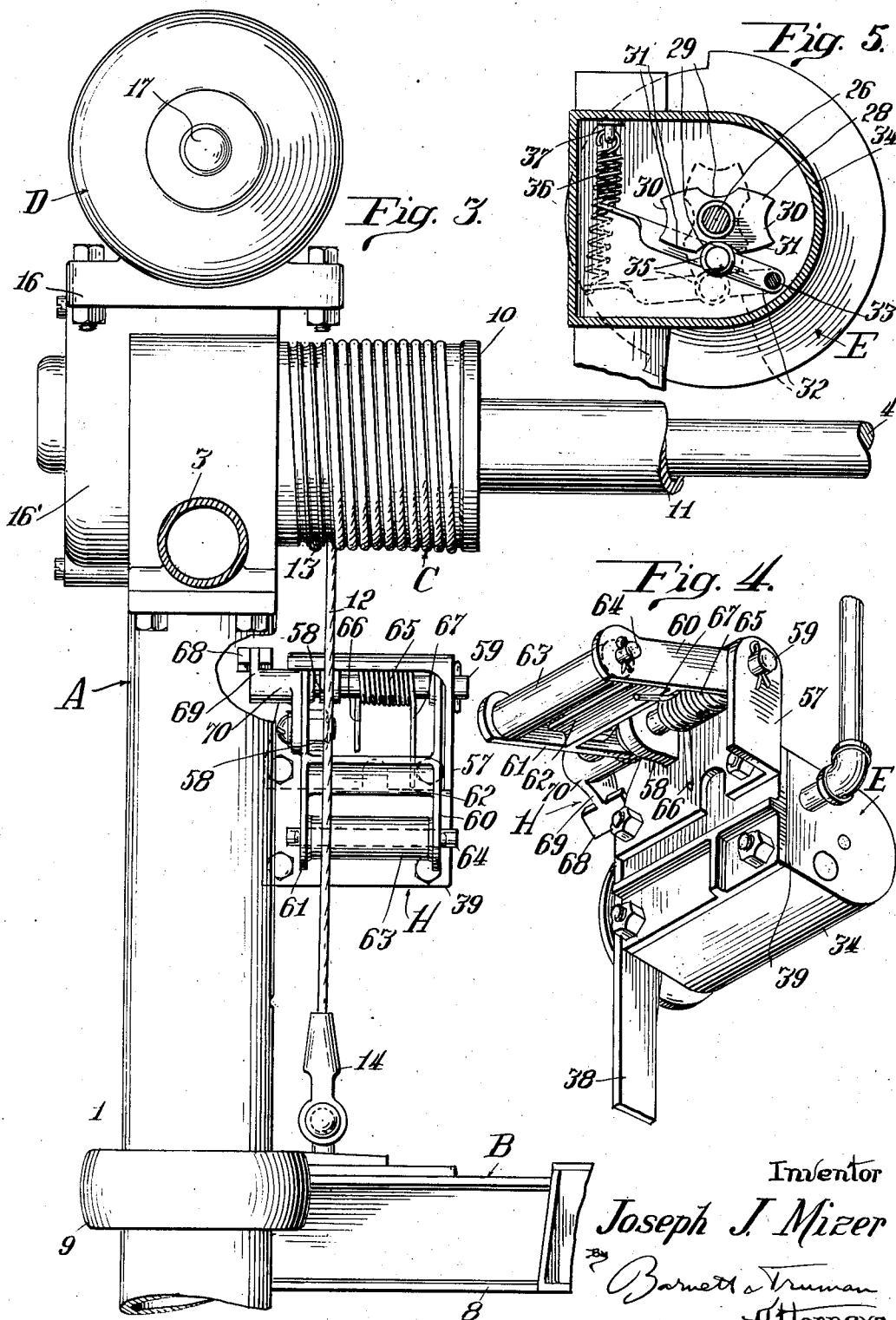
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SLACK CABLE STOP FOR HOISTS

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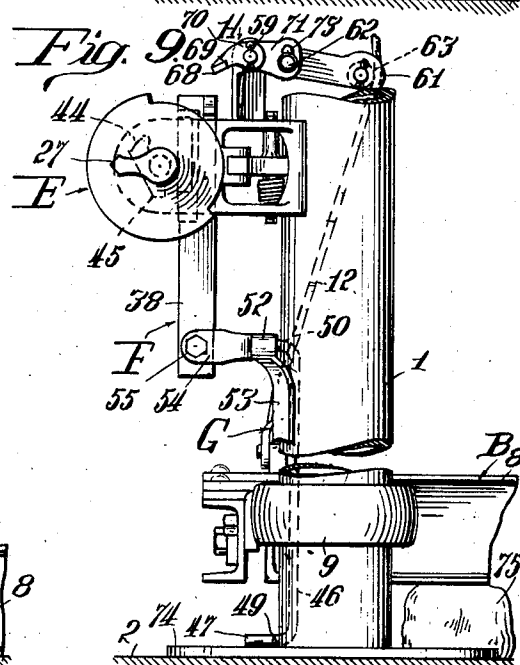
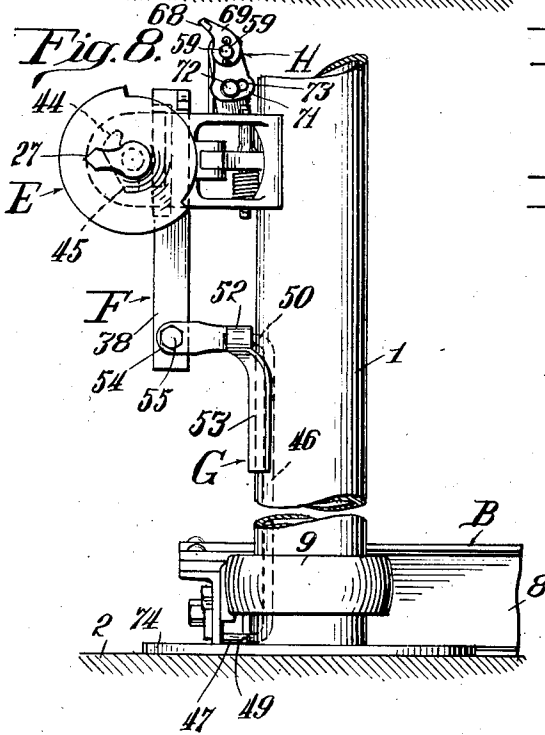
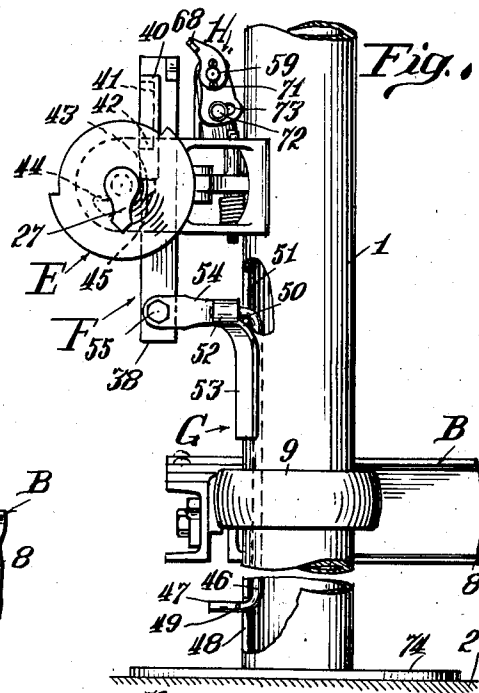
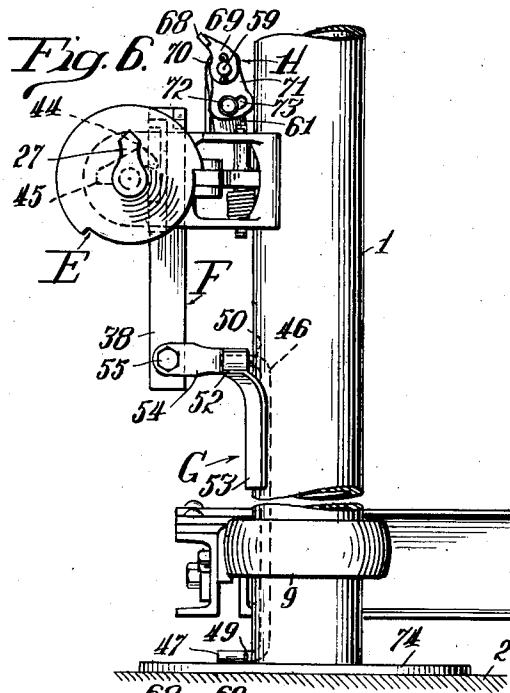
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SLACK CABLE STOP FOR HOISTS

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

1,990,241

SLACK CABLE STOP FOR HOISTS

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Application July 2, 1934, Serial No. 733,429

16 Claims. (Cl. 187—29)

This invention relates to certain new and useful improvements in a slack cable stop mechanism and more particularly to such a stop mechanism designed for use with hoisting mechanism of the type adapted to bodily elevate an automobile so as to permit easy access to the under portions of the chassis.

Briefly described, a hoisting mechanism of the type to which this invention is preferably applied, embodies a plurality of separate upright posts positioned adjacent the corners of a clear space into which the automobile may be run. An open carriage structure adapted to support the automobile is guided for vertical movement between the posts, the carriage preferably being provided with guides engaging the several posts. The means for raising and lowering the carriage comprises a winding mechanism operated by a reversible electric motor supported adjacent the upper end of one of the posts. Cables extend from the winding mechanism to the several corner portions of the carriage, the carriage being suspended from these cables at all times so as to normally keep the cables taut. The motor is controlled by means of a switch mechanism, preferably supported adjacent the upper end of one of the posts, the switch comprising a member which is swung through a certain arc in one direction from a neutral position to cause the motor to elevate the carriage, the member being swung through a similar arc in the opposite direction from neutral position to reverse the motor and cause the carriage to be lowered. A hoisting mechanism of this general type provided with numerous detailed improvements and safety devices not herein specifically disclosed or referred to, is disclosed more in detail and claimed in the patent to Willard T. Walker, 1,958,026, granted May 8, 1934.

The present invention is concerned more particularly with a stop mechanism adapted to automatically throw the control switch to neutral position and thus stop the motor and winding mechanism whenever one of the cables becomes slack for any reason, for example when the weight of the carriage is no longer suspended from the cables. A vertically shiftable device positioned adjacent the switch mechanism is adapted to engage cooperating members on the switch for automatically throwing the switch to neutral position. This vertically shiftable member will ordinarily form a portion of a limit stop mechanism which is engaged by the carriage as it nears either limit of its vertical travel so as to automatically stop the motor. The cable-controlled portion of

the stop mechanism comprises a member pivotally mounted adjacent the shiftable member and provided with an arm which is adapted to be moved into engagement with the shiftable member to actuate the same and throw the switch to neutral position. This pivoted member also comprises an arm carrying a roller which is always held in engagement with the cable by means of a spring which tends to swing the pivoted member in a direction to actuate the stop device. As long as the cable is taut, the pivoted member will be held in inoperative position, but as soon as the cable becomes slack the spring will swing the member so as to actuate the vertically shiftable device and throw the switch to neutral position.

The principal object of this invention is to provide an improved automatic slack cable stop mechanism of the type briefly described hereinabove and disclosed more in detail in the specifications which follow.

Other objects and advantages of this invention will be more apparent from the following detailed description of one approved form of device constructed and operating according to the principles of this invention.

In the accompanying drawings:

Fig. 1 is a side elevation of the hoisting apparatus in elevated position, the corner-posts being partially broken away intermediate their ends.

Fig. 2 is an enlarged elevation of the operating assembly shown in the upper left-hand portion of Fig. 1, the view being taken from the opposite side, that is within the end portion of the hoisting mechanism, and certain of the parts being broken away.

Fig. 3 is an enlarged elevation looking from the left at the assembly shown in Fig. 2.

Fig. 4 is a perspective view of the slack cable controlled portion of the stop mechanism. The spring actuated portion of this mechanism is shown in its released position in this view, whereas in Figs. 1, 2 and 3 it is shown in the normal position in which it is held by the taut cable.

Fig. 5 is a vertical section through a portion of the switch mechanism, showing the device for holding the switch yieldably in each of its "off" and "on" positions.

Figs. 6, 7, 8 and 9 are similar partial side elevations showing the stop mechanism in several different operative positions.

Fig. 10 is a perspective view of the longitudinally shiftable cam-plate for throwing the switch to stop position.

The apparatus may be described in general as comprising a fixed supporting frame indicated

generally at A, a vertically movable carriage B guided within frame A, a cable hoisting mechanism indicated generally at C which is mounted on the frame A and from which the carriage B is suspended, a driving motor D, the switch mechanism E for controlling the motor, and the stop mechanism indicated generally at F, this stop mechanism being operable either by the limit-stop mechanism G or by the slack-cable controlled mechanism indicated at H which forms (in combination with the other apparatus herein disclosed) the particular subject matter of this invention.

The frame A comprises four similar upright posts or standards 1, preferably in the form of hollow metallic pipe sections which are mounted outside of but adjacent four corners of a rectangular clear space suitable for receiving the automobile or other vehicle to be hoisted. These posts are fixedly supported in any suitable manner, preferably by embedding the lower end portions thereof in the ground or other supporting foundation, indicated at 2. The upper ends of the pair of posts at each side of the frame are connected by a horizontal brace member 3, and the upper end portions of the two posts at one end of the frame (the left-hand end in Fig. 1) are connected by a non-rotatable shaft 4 (see Figs. 2 and 3).

The carriage B may be of any suitable construction for supporting the automobile so as to permit as free access as possible to the under portions of the car. In the example here shown the carriage comprises a pair of longitudinally extending beams 5 adapted to engage beneath the front axle 6 and some portions 7 of the rear axle assembly so as to support the automobile. Alternatively, a pair of runways may be used spaced apart so as to receive the four wheels of the automobile. These longitudinal carriage members are connected adjacent the posts 1 by transversely extending beams 8 provided at their ends with guide members engaging the respective posts. As here shown, these guides are in the form of loops 9 which engage loosely about the posts while the carriage is in normal horizontal position but which will bind against the posts to support the carriage should some portion of the cable hoisting mechanism fail so as to permit the carriage to cant in any direction from its normal horizontal position.

The winding mechanism C comprises a pair of similar winding drums 10, one positioned adjacent the upper end of each of the posts 1 at one end of the frame, the drums being connected by the torque tube 11 mounted around fixed shaft 4 so that the drums will be supported to rotate in unison. A pair of cables 12 and 13 are each fixedly secured at one end to a drum 10, the other end of cable 12 extending downwardly from the drum and being anchored by some suitable means, such as 14, to one corner portion of the carriage. The other cable 13 extends substantially horizontally from the drum 10, adjacent the brace beam 3, to and over a direction sheave 15 supported at the upper end of the post 1 at the other end of the frame, and thence downwardly and is secured to the adjacent corner portion of the carriage B. A similar pair of cables 12 and 13 extend from the other drum 10 and are secured to and support the other two corners of the carriage structure.

The reversible electric motor D is supported on the bracket extension 16 of gear casing 16' adjacent the upper end of one of the posts 1. The motor shaft 17 is connected through coupling 18

with the driving worm shaft 19 which meshes with worm wheel 20 and thence through the train of gearing 21, 22, 23 and 24 drives one end of the winding drum assembly. The automatic friction brake mechanism indicated generally at 25 and described more in detail in the Walker patent hereinabove referred to, serves as a safety brake for the winding mechanism and motor when the load is being lowered.

The switch mechanism indicated generally at E controls the reversible motor G. The switch mechanism is controlled by the rock shaft 26 on the outer end of which is secured the pointer and operating handle 27. When the switch is in stop or neutral position, this member 27 will be positioned horizontally as shown in Figs. 1, 8 and 9. To start the motor D for elevating the carriage, the member 27 is swung in a clockwise direction through an angle of 90° to the position shown in Fig. 6. To lower the carriage this member is swung through an angle of 90° in the opposite direction as shown in Fig. 7.

The switch mechanism E is provided with mechanism as shown in Fig. 5 for automatically throwing the switch to "off" or neutral position whenever a movement from either of its operative positions has been sufficiently started, and for yieldably holding the switch in each of its three operative positions. This mechanism will be positioned as shown in solid lines, Fig. 5, when the switch is in "off" or neutral position, and will be positioned as shown in dotted lines when the switch is moved to either of its operating positions for causing the carriage to move either up or down. The cam member 28 is fixed to the shaft 26 and is formed in one side with an arcuate notch 29, and in its two ends with similar notches 30 spaced further from the axis of the shaft than the central notch 29. The ends of notch 29 are connected with the respective notches 30 by the inclined cam surfaces 31. The lever 32 pivoted at one end 33 to some convenient fixed member (preferably within the switch housing 34) carries a roller 35 which is adapted to engage alternatively with one or another of the notches 29 and 30 and with the cam surfaces 31. The lever 32 is continuously urged in one direction so as to hold the roller 35 against cam member 28 by means of spring 36 anchored at one end 37 within housing 34 and secured at its other end to the free end of lever 32. When the switch is in "off" or neutral position, spring 36 will hold roller 35 within notch 29 and thus yieldably hold the switch mechanism in this position. If switch member 27 is manually swung in one direction or the other (that is to either of the positions shown in Figs. 6 or 7) the roller 35 will be forced out of notch 29 and along one of the cam surfaces 31 into one or the other of the end notches 30, whereupon spring 36 will snap the roller 35 into this notch 30 so as to yieldably hold the switch mechanism in the selected operative position. Now if the switch shaft 26 is moved, either manually or automatically, from this operative position sufficiently to move roller 35 out of notch 30, the spring 36 will force the roller along the cam surface 31 so as to automatically throw the switch completely to its neutral position and hold it in this position. As will be hereinafter apparent, this mechanism also functions to yieldably support, at times, a portion of the automatic stop mechanism in its elevated position.

A vertically shiftable switch-actuating plate 38 is guided for vertical sliding movement in the switch supporting bracket 39. The upper por-

tion of this plate is offset at 40 (see Fig. 10) so as to provide a vertically extending socket 41 at the bottom of which is an upwardly facing shoulder 42 and below which is a downwardly facing shoulder 43. Secured on the rock shaft 26 of the switch are an upwardly projecting arm or finger 44 and a downwardly projecting arm or finger 45. When the switch is in "off" or neutral position, these fingers will be out of engagement with the operating plate 38 as shown in Figs. 8 and 9. When the switch is rocked upwardly to cause the motor B to elevate the load, the finger 44 will be swung into the socket 41 of plate 38 so as to be within the path of upward movement of the shoulder 42. This position is shown in Fig. 6 of the drawings. When the switch member is swung downwardly to lower the load, the finger 45 will be swung beneath the shoulder 43 of plate 38 as shown in Fig. 7. This shiftable actuating plate 38 is automatically moved in one direction or the other to engage one of the arms 44 or 45 and start the switch toward neutral position, this movement of the switch being completed by the spring-actuated snap mechanism shown in Fig. 5 and already described.

This vertical actuating movement is imparted to plate 38 either by the limit-stop mechanism indicated generally at G or by the slack-cable mechanism indicated generally at H. The limit-stop mechanism G comprises a vertically shiftable rod or bar 46 which is preferably housed within the hollow post 1 on which the switch E is mounted. The lower outwardly turned end portion 47 of this rod projects through a vertical slot 48 in the lower portion of the post so as to be in the path of movement of the carriage guide 9, or some other adjacent portion of the carriage. A transverse pin 49 holds this end of the rod in its outwardly projected position. The outwardly turned upper end portion 50 of this rod 46 projects outwardly through a vertical slot 51 in the upper portion of post 1 and is anchored in a bracket member 52 having an arm 53 which projects downwardly along the outer side of the post to be engaged by the upper surface of the carriage guide 9 as it nears its upper limit of travel. A second arm 54 of this bracket member projects outwardly and is secured at 55 to the lower end portion of the switch-actuating plate 38, already described. This limit-stop mechanism, the operation of which will be hereinafter described, has already been disclosed and claimed in the patent to Willard T. Walker, 1,960,283, granted May 29, 1934.

The slack-cable stop mechanism H which forms, in combination with portions of the limit-stop mechanism already described, the particular subject matter of this invention, will now be described. A bracket plate 56 is mounted on the switch assembly E (or some other convenient portion of the supporting frame), this plate being formed with an end flange 57 and a bracket extension 58 in which is mounted the pivot pin 59. A swinging frame comprising side lever arms 60 and 61 connected by the intermediate cross member 62 is mounted in bracket plate 56 by having the inner ends of the lever arms 60 and 61 pivoted on pin 59. A long roller 63 is mounted on pin 64 secured in the outer end portions of lever arms 60 and 61 pivoted on pin 59. The roller 63 is adapted to bear against the vertical run of cable 12. A torsion spring 65 is coiled about pin 59 and has one end 66 engaging against supporting plate 56 and the other end 67 bearing against the cross member 62 of the swinging

frame. This spring 65 is of sufficient strength to swing the frame to the position shown in Fig. 4 (in case cable 12 is slack) and to actuate the stop mechanism in the manner hereinafter described. Under normal conditions, the swinging frame will be held down against the tension of spring 65 by the taut cable 12 bearing against the roller 63 all as shown in Figs. 2 and 3. An operating finger 68, adapted to engage the upper end portion of the shiftable plate 38, is formed on the outer end of the lever or crank arm 69 formed on hub 70 journaled on one outer end portion of pin 59. A second lever arm 71 extending from this hub 70 is adjustably secured to the lever arm 61 of the swinging frame by means of a clamping screw 72 mounted in arm 61 and extending through a slot 73 in the arm 71. It will thus be noted that the operating finger 68 forms an extension of and moves with the swinging frame, but its position relative to the frame may be adjusted by means of screw 72. Normally this finger 68 will be positioned adjacent to the path of vertical movement of the upper end portion of plate 38, but out of engagement therewith, as best shown in Figs. 6, 7 and 8.

The operation of this entire stop mechanism will now best be understood by referring to the successive positions of the parts as shown in Figs. 1, 6, 7, 8 and 9. As shown in Fig. 8, the hoist has been completely lowered, the operating parts are all at rest, and the switches in neutral position. However, although the carriage is at the lower end of its path of travel the hoisting cables are still taut and the slack cable device H is still held in inoperative position. At this time the lower end portion of rod 46 rests upon the supporting base 2 or upon the base plate 74 at the lower end of post 1, so as to support the rod 46 and switch actuating plate 38 in this lowermost position. In order to elevate the load, the switch member 27 is swung upwardly in a clockwise direction through an angle of 90° to the position shown in Fig. 6. This brings the operating finger 44 into the socket 41 of the plate 38 above the shoulder 42. As shown in Fig. 6, the carriage is traveling upwardly but the guide 9 has not yet engaged with the arm 53 of the stop mechanism. As the carriage nears its upper limit of travel the guide 9 will engage the lower end of arm 53 and lift the rod 46 and actuating plate 38 so as to bring the shoulder 42 of the plate into engagement with finger 44 and swing the switch shaft back toward neutral position. When this movement has progressed far enough to move the roller 35 out of notch 30 and on to one of the cam surfaces 31, the switch will be snapped completely to "off" or neutral position by spring 36. The parts will now be positioned as shown in Fig. 1.

When the carriage is to be lowered, the switch member is swung through an arc of 90° in a counter-clockwise direction so that the pointer 27 will project downwardly as shown in Fig. 7. This will bring the finger 45 on the switch shaft underneath the shoulder 43 on the operating plate 38. As the carriage guide 9 moves downwardly it will no longer support the bracket 52, but the operating members of the stop mechanism will now be supported by the finger 45 on the switch shaft and the locking mechanism shown in Fig. 5. This position of the parts is indicated in Fig. 7. As the carriage nears its lower limit of travel, the guide 9 will engage the outwardly projecting lower end portion 47 of rod 46 and pull the rod 46 and actuating plate 38 downwardly so as to swing the finger 45 and

switch shaft 26 back in a clockwise direction toward neutral position, and as soon as this movement has progressed sufficiently to move the roller 35 out of notch 30 onto the cam surface 31 the switch will be snapped completely to its neutral position. The carriage and motor will now be stopped with all of the parts in the positions shown in Fig. 8.

Now let us suppose that before the carriage B reaches its lower limit of travel, and before the carriage has engaged the stop projection 47, the carriage encounters some obstacle such as indicated at 75 in Fig. 9 so as to prevent further lowering movement of the carriage. However the motor D is still operating the winding mechanism C so as to unwind the cables, and unless this movement is halted the cables will be completely unwound and will commence to wind back in the reverse direction. This might damage the mechanism and would cause an undesired elevating movement of the carriage. However, as soon as the weight of the carriage is no longer suspended from the cables, and the cable 12 becomes slack, the spring 65 will swing the roller-carrying frame toward the cable thus swinging down the operating finger 68 into engagement with the upper end of operating plate 38 so as to move this plate downwardly and cause the switch to be thrown to its stop position. This position of the parts is shown in Fig. 9.

If at any time when the motor is operating to unwind the cable, the cables should become slack, this stop mechanism will immediately operate to deenergize the motor and stop the winding mechanism. For example, if the cable 12 against which the roller 63 bears should break or become detached, the motor will be stopped. If one of the other cables should break the carriage will cant so as to cause the loop 9 to grip the post and stop the carriage, whereupon the cables will become slack and the motor will stop.

It will be understood that the limit-stop mechanism operates normally whenever the carriage reaches its upper or lower limits of travel, but the slack cable portion H of the stop device is a safety mechanism and under normal operating conditions will remain continuously in the inoperative position shown in Figs. 1, 6, 7 and 8.

I claim:

1. In combination with a hoist comprising a supporting frame, a carriage, a winding mechanism, a cable extending from the winding mechanism to the carriage and normally supporting a portion of the carriage, a motor for operating the winding mechanism and a control switch for the motor movable from a neutral position in which the motor is at rest to alternative positions for causing the carriage to be raised or lowered, a stop mechanism comprising means normally tending to throw the switch to neutral position, and a member engaging against a run of the cable and functioning to hold the last mentioned means in inoperative position as long as the cable is taut.

2. In combination with a hoist comprising a supporting frame, a carriage, a winding mechanism, a cable extending from the winding mechanism to the carriage and normally supporting a portion of the carriage, a motor for operating the winding mechanism and a control switch for the motor movable from a neutral position in which the motor is at rest to alternative positions for causing the carriage to be raised or lowered, a stop mechanism comprising a shiftable member adapted to throw the switch to

neutral position to stop the motor, an actuating member positioned adjacent the path of movement of the shiftable member and adapted to engage and move the shiftable member to stop the motor, a spring normally tending to cause this operative movement of the actuating member, and a member engaging the cable and holding the actuating member in inoperative position against the tension of the spring as long as the cable is taut.

3. In combination with a hoist comprising a supporting frame, a carriage, a winding mechanism, a cable extending from the winding mechanism to the carriage and normally supporting a portion of the carriage, a motor for operating the winding mechanism, and a control switch for the motor movable from a neutral position in which the motor is at rest to alternative positions for causing the carriage to be raised or lowered, a stop mechanism comprising a shiftable member adapted to throw the switch to neutral position to stop the motor, a lever pivotally mounted adjacent the shiftable member, an arm on this lever adapted to engage and move the shiftable member, a roller carried by an arm of the lever and engaging the cable to hold the lever in inoperative position as long as the cable is taut, and a spring tensioned to swing the lever when the cable is slack and cause the first mentioned lever arm to engage and move the shiftable member to stop the motor.

4. In combination with a hoist comprising a supporting frame, a carriage, a winding mechanism, a cable extending from the winding mechanism to the carriage and normally supporting a portion of the carriage, a motor for operating the winding mechanism, and a control switch for the motor movable from a neutral position in which the motor is at rest to alternative positions for causing the carriage to be raised or lowered, a stop mechanism comprising a shiftable member adapted to throw the switch to neutral position to stop the motor, a swinging frame mounted adjacent the shiftable member, a roller mounted in the frame and engaging a vertical run of the cable at all times, a spring engaging the frame and holding the roller against the taut cable, and an arm on the frame positioned to engage and operate the shiftable member, the spring acting to swing the frame and cause the arm to operate the shiftable member and stop the motor when the cable is slack.

5. In combination with a hoist comprising a supporting frame, a carriage, a winding mechanism, a cable extending from the winding mechanism to the carriage and normally supporting a portion of the carriage, a motor for operating the winding mechanism, and a control switch for the motor movable from a neutral position in which the motor is at rest to alternative positions for causing the carriage to be raised or lowered, a stop mechanism comprising a shiftable member adapted to throw the switch to neutral position to stop the motor, a swinging frame mounted adjacent the shiftable member, a roller mounted in the frame and engaging a vertical run of the cable at all times, a spring engaging the frame and holding the roller against the taut cable, and an arm adjustably positioned on the frame to engage and operate the shiftable member, the spring acting to swing the frame and cause the arm to operate the shiftable member and stop the motor when the cable is slack.

6. In combination with a hoist comprising a

supporting frame, a carriage, a winding mechanism, a cable extending from the winding mechanism to the carriage and normally supporting a portion of the carriage, a motor for operating the winding mechanism, and a control switch for the motor movable from a neutral position in which the motor is at rest to alternative positions for causing the carriage to be raised or lowered, a stop mechanism comprising a shiftable member adapted to throw the switch to neutral position to stop the motor, means for moving the shiftable member to stop the motor as the carriage nears either limit of its travel, an actuating member positioned adjacent the path of movement of the shiftable member and adapted to engage and move the shiftable member to stop the motor, a spring normally tending to cause this operative movement of the actuating member, and a member engaging the cable and holding the actuating member in inoperative position against the tension of the spring as long as the cable is taut.

7. In combination with a hoist comprising a supporting frame, a carriage, a winding mechanism, a cable extending from the winding mechanism to the carriage and normally supporting a portion of the carriage, a motor for operating the winding mechanism, and a control switch for the motor movable from a neutral position in which the motor is at rest to alternative positions for causing the carriage to be raised or lowered, a stop mechanism comprising a shiftable member adapted to throw the switch to neutral position to stop the motor, means for moving the shiftable member to stop the motor as the carriage nears the limit of its travel, a swinging frame mounted adjacent the shiftable member, a roller mounted in the frame and engaging a vertical run of the cable at all times, a spring engaging the frame and holding the roller against the taut cable, and an arm on the frame positioned to engage and operate the shiftable member, the spring acting to swing the frame and cause the arm to operate the shiftable member and stop the motor when the cable is slack.

8. In combination with a hoist comprising a supporting frame, a carriage, a winding mechanism, a cable extending from the winding mechanism to the carriage and normally supporting a portion of the carriage, a motor for operating the winding mechanism, and a control switch for the motor movable from a neutral position in which the motor is at rest to alternative positions for causing the carriage to be raised or lowered, a stop mechanism comprising a shiftable member adapted to throw the switch to neutral position to stop the motor, means engaged by the carriage as it nears either limit of its travel for moving the shiftable member to stop the motor, an actuating member positioned adjacent the path of movement of the shiftable member and adapted to engage and move the shiftable member to stop the motor, a spring normally tending to cause this operative movement of the actuating member, and a member engaging the cable and holding the actuating member in inoperative position against the tension of the spring as long as the cable is taut.

9. In combination with a hoist comprising a supporting frame, a carriage, a winding mechanism, a cable extending from the winding mechanism to the carriage and normally supporting a portion of the carriage, a motor for operating the winding mechanism, and a control switch for the motor movable from a neutral position

in which the motor is at rest to alternative positions for causing the carriage to be raised or lowered, a stop mechanism comprising a shiftable member adapted to throw the switch to neutral position to stop the motor, means engaged by the carriage as it nears either limit of its travel for moving the shiftable member to stop the motor, a swinging frame mounted adjacent the shiftable member, a roller mounted in the frame and engaging a vertical run of the cable at all times, a spring engaging the frame and holding the roller against the taut cable, and an arm on the frame positioned to engage and operate the shiftable member, the spring acting to swing the frame and cause the arm to operate the shiftable member and stop the motor when the cable is slack.

10. The combination with a hoist comprising a supporting frame, a vertically movable carriage, a winding mechanism, a cable extending from the winding mechanism to the carriage and normally supporting a portion of the carriage, a motor for operating the winding mechanism, a control switch for the motor comprising a member adapted to be swung in either direction from a neutral position to initiate either a raising or lowering movement of the carriage, and means for yieldably holding the switch member in its neutral or either of its motor actuating positions, an automatic stop mechanism comprising a shiftable member positioned adjacent the switch member and having an offset portion, a pair of fingers on the switch member movable alternatively into the path of movement of the offset portion of the shiftable member as the switch member is swung in one direction or the other from neutral position, a means connected with the shiftable member and engaged by a portion of the carriage as the carriage nears either limit of its vertical travel to move the shiftable member and stop the motor, an actuating member positioned adjacent the path of movement of the shiftable member and adapted to engage and move the shiftable member to stop the motor, a spring normally tending to cause this operating movement of the actuating member, and a member engaging the cable and holding the actuating member in inoperative position against the tension of the spring as long as the cable is taut.

11. The combination with a hoist comprising a supporting frame, a vertically movable carriage, a winding mechanism, a cable extending from the winding mechanism to the carriage and normally supporting a portion of the carriage, a motor for operating the winding mechanism, a control switch for the motor comprising a member adapted to be swung in either direction from a neutral position to initiate either a raising or lowering movement of the carriage, and means for yieldably holding the switch member in its neutral or either of its motor actuating positions, an automatic stop mechanism comprising a shiftable member positioned adjacent the switch member and having an offset portion, a pair of fingers on the switch member movable alternatively into the path of movement of the offset portion of the shiftable member as the switch member is swung in one direction or the other from neutral position, a means connected with the shiftable member and engaged by a portion of the carriage as the carriage nears either limit of its vertical travel to move the shiftable member and stop the motor, an actuating device normally tending to throw the shift-

able member to stop the motor, and a member engaging the cable and functioning to hold the actuating device in inoperative position as long as the cable is taut.

12. The combination with a hoist comprising a supporting frame, a vertically movable carriage, a winding mechanism, a cable extending from the winding mechanism to the carriage and normally supporting a portion of the carriage, a motor for operating the winding mechanism, a control switch for the motor comprising a member adapted to be swung in either direction from a neutral position to initiate either a raising or lowering movement of the carriage, and means for yieldably holding the switch member in its neutral or either of its motor actuating positions, an automatic stop mechanism comprising a shiftable member positioned adjacent the switch member and having an offset portion, a pair of fingers on the switch member movable alternatively into the path of movement of the offset portion of the shiftable member as the switch member is swung in one direction or the other from neutral position, a means connected with the shiftable member and engaged by a portion of the carriage as the carriage nears either limit of its vertical travel to move the shiftable member and stop the motor, a lever pivotally mounted adjacent the shiftable member, an arm on this lever adapted to engage and move the shiftable member, a roller carried by an arm of the lever and engaging the cable to hold the lever in inoperative position as long as the cable is taut, and a spring tensioned to swing the lever when the cable is slack and cause the first mentioned lever arm to engage and move the shiftable member and stop the motor.

13. The combination with a hoist comprising a supporting frame, a vertically movable carriage, a winding mechanism, a cable extending from the winding mechanism to the carriage and normally supporting a portion of the carriage, a motor for operating the winding mechanism, a control switch for the motor comprising a member adapted to be swung in either direction from a neutral position to initiate either a raising or lowering movement of the carriage, and means for yieldably holding the switch member in its neutral or either of its motor actuating positions, an automatic stop mechanism comprising a shiftable member positioned adjacent the switch member and having an offset portion, a pair of fingers on the switch member movable alternatively into the path of movement of the offset portion of the shiftable member as the switch member is swung in one direction or the other from neutral position, a means connected with the shiftable member and engaged by a portion of the carriage as the carriage nears either limit of its vertical travel to move the shiftable member and stop the motor, a swinging frame mounted adjacent the shiftable member, a roller mounted in the frame and engaging a vertical run of the cable at all times, a spring engaging the frame and holding the roller against the taut cable, and an arm on the frame positioned to engage and operate the shiftable member, the spring acting to swing the frame and cause the arm to operate the

shiftable member and stop the motor when the cable is slack.

14. The combination with a hoist comprising a supporting frame, a vertically movable carriage, a winding mechanism, a cable extending from the winding mechanism to the carriage and normally supporting a portion of the carriage, a motor for operating the winding mechanism, a control switch for the motor comprising a member adapted to be swung in either direction from a neutral position to initiate either a raising or lowering movement of the carriage, and means for yieldably holding the switch member in its neutral or either of its motor-actuating positions, an automatic stop mechanism comprising a shiftable member positioned adjacent the switch member and having an offset portion, a pair of fingers on the switch member movable alternatively into the path of movement of the offset portion of the shiftable member as the switch member is swung in one direction or the other from neutral position, a means connected with the shiftable member and engaged by a portion of the carriage as the carriage nears either limit of its vertical travel to move the shiftable member and stop the motor, a swinging frame mounted adjacent the shiftable member, a roller mounted in the frame and engaging a vertical run of the cable at all times, a spring engaging the frame and holding the roller against the taut cable, and an arm adjustably positioned on the frame to engage and operate the shiftable member, the spring acting to swing the frame and cause the arm to operate the shiftable member and stop the motor when the cable is slack.

15. In combination with a hoisting device comprising a winding mechanism, a cable extending from the winding mechanism and normally held taut by the load to be raised or lowered, a motor for operating the winding mechanism, and a control switch for the motor movable from a neutral position in which the motor is at rest to alternative positions for causing the winding mechanism to be rotated in one direction or the other, a stop mechanism comprising means normally tending to throw the switch to neutral position, and a member engaging against a run of the cable and functioning to hold the last-mentioned means in inoperative position as long as the cable is taut.

16. In combination with a hoisting device comprising a winding mechanism, a cable extending from the winding mechanism and normally held taut by the load to be raised or lowered, a motor for operating the winding mechanism, and a control switch for the motor movable from a neutral position in which the motor is at rest to alternative positions for causing the winding mechanism to be rotated in one direction or the other, a stop mechanism comprising spring actuated means normally tending to throw the switch to neutral position, and a member engaging against a run of the cable and functioning to hold the last mentioned means in inoperative position in opposition to the force of the spring as long as the cable is taut.

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