Jan. 8, 1952 S. L. SAXTON ET AL 2,581,887

CARGO LIFT

Filed Dec. 7, 1949 3 Sheets-Sheet 1

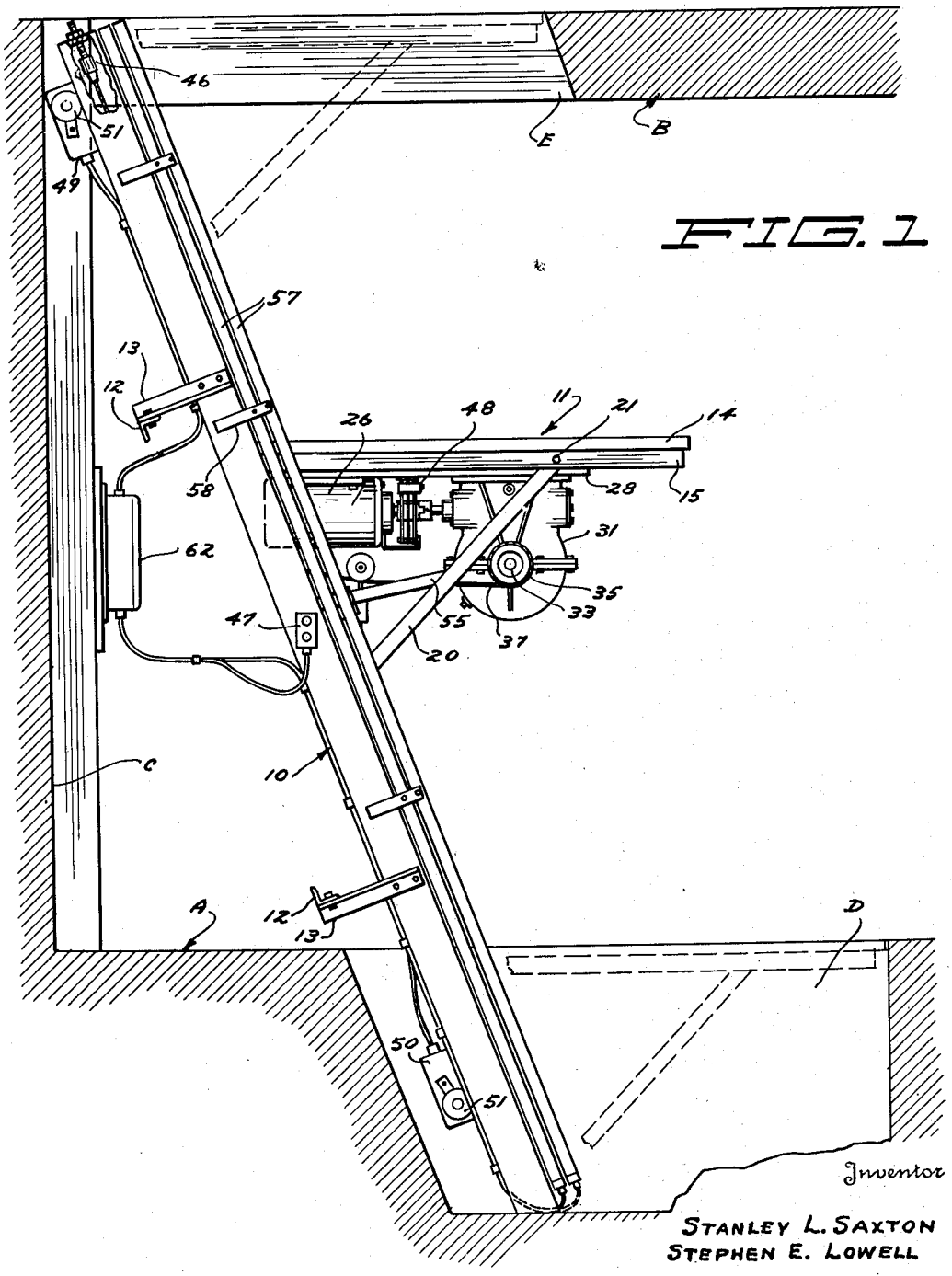


FIG. 1

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Jan. 8, 1952 S. L. SAXTON ET AL 2,581,887

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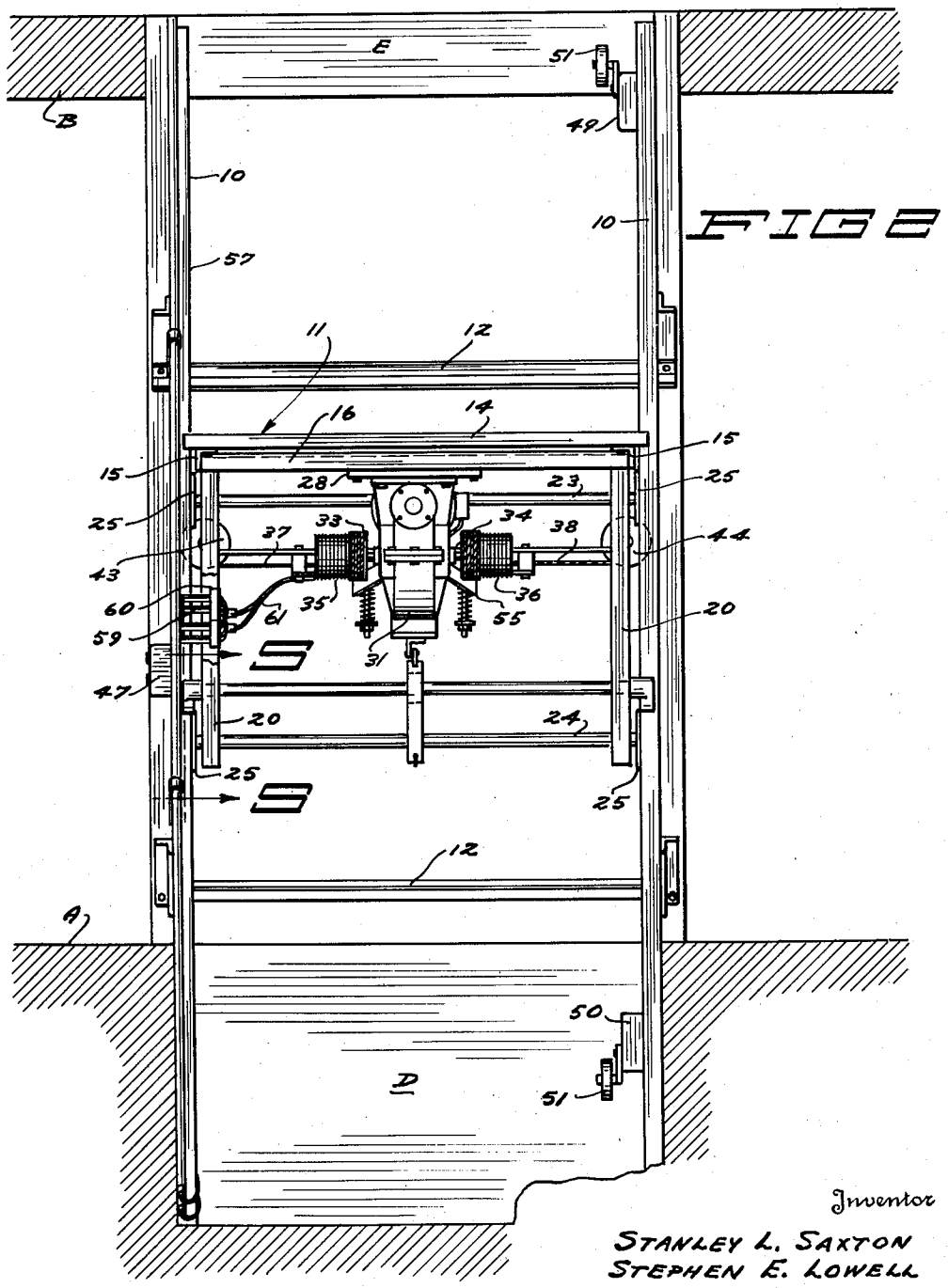


FIG 2

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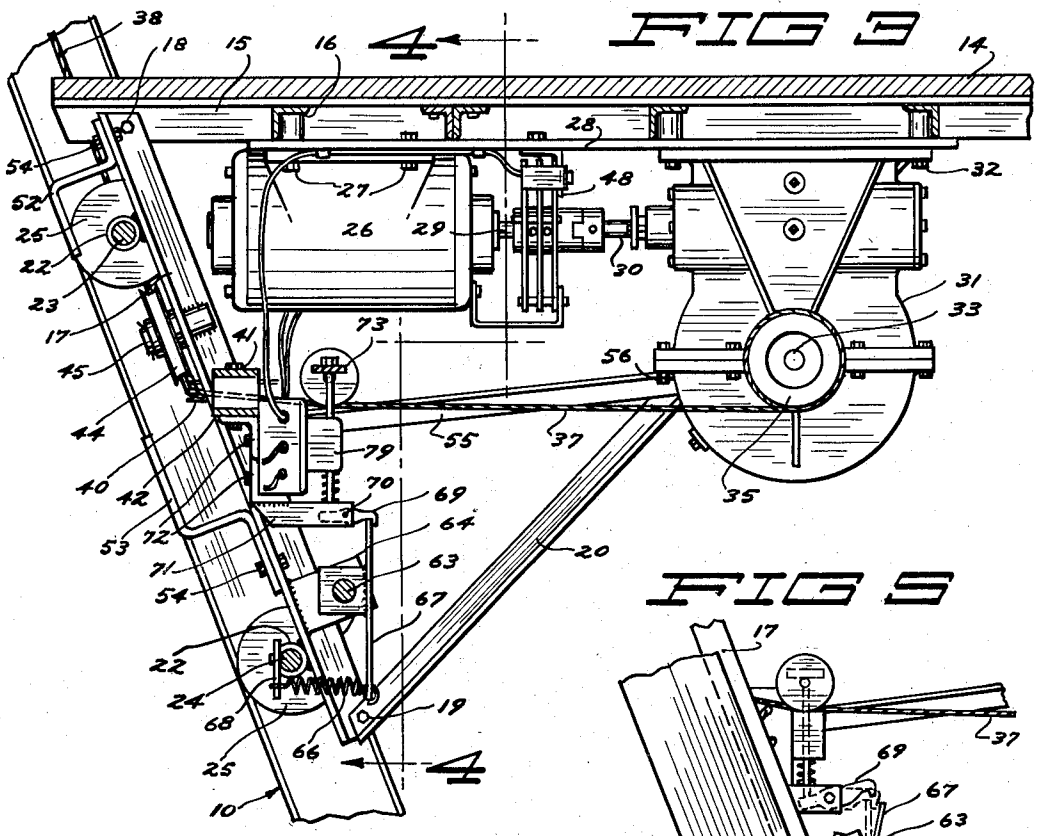
By Carlson & Hayle

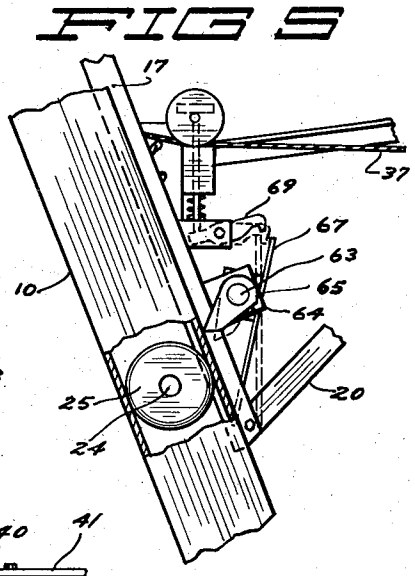
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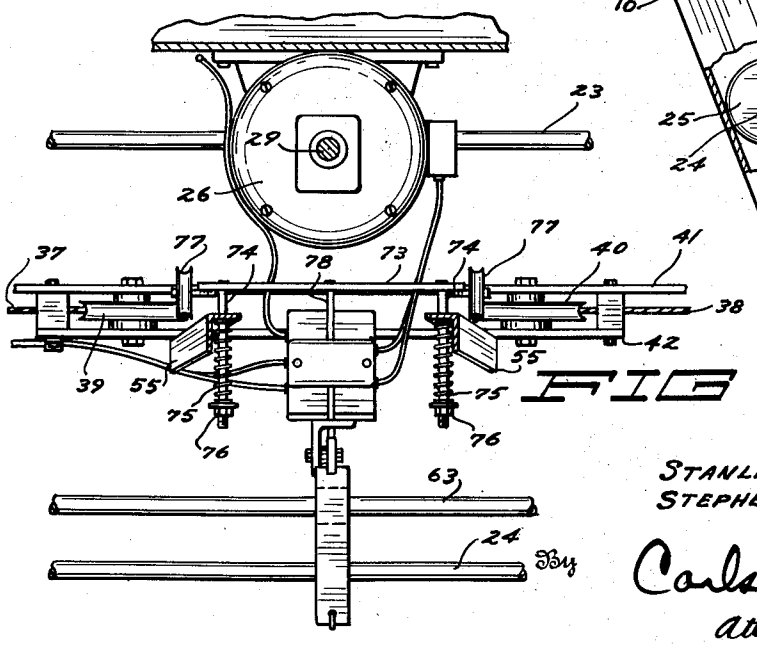
Jan. 8, 1952 S. L. SAXTON ET AL 2,581,887

CARGO LIFT

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UNITED STATES PATENT OFFICE

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CARGO LIFT

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1

This invention relates generally to the improvements in cargo elevators and more particularly to the comparatively small and simple lifts of this general type, designed for carrying cargo or merchandise from one floor to another, and which do not require the expensive elevator shafts such as used in larger buildings.

The primary object of our invention is to provide a cargo lift of this general nature which is simple and comparatively inexpensive both in construction and installation and which lends itself to use either in the conventional stairwell in conjunction with the stairway therein, or to simple installation between floors wherever space is available and if desired in conjunction with trap doors in said floors.

Another object of our invention is to provide a cargo lift embodying spaced rails secured to and between the floors to be served and a carriage travel mounted on said rails for up and down movements by means of winch drums operated by an electric motor and in turn operating cables by which the carriage is positioned. In this regard the present lift and this application are related to the stairway elevator disclosed in our prior co-pending application Serial No. 69,868 filed January 8, 1949 now Patent No. 2,516,726, dated July 25, 1950.

A further and important object is the provision of a cargo lift of this type of safety means constituting a fail-safe mechanism which will automatically and instantaneously lock the carriage against downward movement should the cables by which the carriage is moved break or become slack for any other reason. In accordance with this object, we further provide means operative by said fail-safe mechanism to automatically shut off power to the motor driving the cable winches, and operate said fail-safe mechanism as well as the motor cut-off switch directly in response to cable tension so that the mechanism will immediately sense any failure and bring the carriage to a stop as well as stop the motor.

A further object of the invention is to provide a cargo lift of the foregoing described nature wherein the operating mechanism including the motor, cable winches and related parts are all carried beneath the platform of the carriage and further to so construct the entire framing assembly that the angle at which the rails are mounted may be varied to suit the requirements of each individual installation with a minimum of trouble and required changes in the overall construction.

2

Still a further object of our invention is to provide numerous detailed improvements in the construction and operation of such devices, all of which contribute to the provision of a cargo lift which may be readily installed in many locations where the use of more conventional shaft type elevators would be utterly impossible.

These and other more detailed and specific objects will be disclosed in the course of the following specification reference being had to the accompanying drawings, in which:

Fig. 1 is a side elevation of a cargo lift according to our invention showing the same as arranged between two adjacent floors of the building and illustrating in dotted lines the uppermost and lowermost positions assumed by the carriage.

Fig. 2 is a front elevational view of the structure as shown in Fig. 1.

Fig. 3 is an enlarged vertical sectional view through the carriage and associated end adjacent parts of the lift structure.

Fig. 4 is a fragmentary and irregular sectional view taken along the line 4—4 in Fig. 3.

Fig. 5 is an enlarged side elevation, partially in section, taken substantially along the line 5—5 in Fig. 2 and showing particularly the automatic lock or stop means for the carriage.

For convenience in this disclosure we have shown our cargo lift as arranged in conjunction with a conventional building structure having a lower floor A and upper floor B and with the lift located in an inclined position adjacent a vertical wall C. So that the carriage of the lift in its lower position may be run down flush with the lower floor A, for the maximum convenience in loading, this floor is provided a pit D, while for delivery of materials to the upper floor B it is provided with an opening E. It will, of course, be understood that this opening E may be covered by conventional automatic trap doors for safety purposes and an important feature of our invention resides in the fact, as seen clearly in Fig. 1, that the installation of the lift requires or forms no obstruction above the level of the upper floor B. As stated, this illustration of the lift is purely for purposes of exemplification and do not, of course, limit ourselves to this particular type of installation.

The cargo has as its primary supports a pair of transversely spaced upright and angularly positioned rails designated generally at 10 which constitute a track along which may travel a carriage or cargo carrier indicated at 11. The rails 10 take the form of conventional channels rig-

idly secured to convenient locations in the building and with the channels turned inwardly in facing relation to accommodate rollers upon the carriage 11 as will presently appear. The rails 10 are rigidly cross connected by tie bars 12 secured in place by angles 13 which so space the cross bars that toe room is provided between the carriage and the bars as the former moves up and down.

The carriage 11 comprises a rectangular platform 14 mounted upon angle iron sills 15 and cross bars 16 and from what may for convenience be termed the rear end of the platform there depends at each side angle iron side bars 17 secured at upper ends at 18 to the aforesaid sills. At their lower ends these side bars 17 are secured at 19 to brace bars 20 which angle from these points upwardly and forwardly to points of attachment at 21 to the sills 16 adjacent the forward ends thereof. The side bars 17 are located parallel with the rails 10 while the platform 14 is horizontally located and the brace bars 20 are, of course, selected as to length to so position the parts. Bearings 22 are secured to the rear faces of the side bar 17 adjacent the upper and lower ends thereof and upper and lower roller shafts 23 and 24 are extended transversely between these bearings to rotatably carry rollers indicated throughout at 25, shaped and positioned to roll in the channels of the rails 10. It will, of course, be understood that the rollers 25 will thus support the carriage 11 for up and down movements along the rails 10 and in so doing the lower pair of rollers will run in contact with the rear flanges of the rails while the upper pair will roll in engagement with the forward flanges.

The carriage 11 is moved up and down the rails and positioned at any point therealong by means of an operating mechanism powered by a conventional reversible electric motor 26 secured at 27 to a hanger plate 28 mounted beneath the platform plate assembly 15—16. The motor shaft 29 extends in a forward direction for connection at 30 to a worm gear transmission unit 31 secured at 32 beneath the forward portion of the hanger plate. The worm driven by the connection 30 operates a worm gear from which there extends in opposite lateral directions winch shafts 33 and 34 upon which are secured spirally grooved winch drums or spools 35 and 36. Cables 37 and 38 are secured to the drums 35 and 36 and extend rearwardly therefrom outwardly and around guide pulleys 39 and 40 journaled between upper and lower cross bars 41 and 42 supported transversely between the side bars 17. After passing around these pulleys 39 and 40 the cables 37 and 38 run beneath and then upwardly around similar pulleys 43 and 44 journaled as indicated at 45 upon the rear surfaces of the side bar 17. The pulleys 43 and 44 thus guide the cables upwardly in the channels of the rails 10 outside of the uppermost rollers 25 and at their upper ends the cables are secured to the upper ends of the rails as indicated at 46. Preferably these connections 46 are arranged to tighten and equalize the cables 37 and 38 in any well known manner.

It will now be understood that the rotation of the winch drums 35 and 36 in one direction will cause the cables 37 and 38 to be wound up and pull the carriage 11 in an upward direction. Reverse rotation of the drums will, of course, pay out the cables in order to permit the carriage to descend of its own weight. It is to be noted that the cables do not themselves move but that the carriage in effect travels up and down on the cables and further since we use a worm gear drive that the carriage is self-locking in any position so long as the cables themselves are in good condition. The motor 26 may be conveniently controlled by a switch box 47 mounted at a convenient height upon one of the rails 10 so that the motor may be started or reversed as may be required. Arranged in conjunction with the motor shaft 29 is a conventional solenoid brake assembly 48 operative when power to the motor is shut off to immediately stop the motor shaft and prevent overrunning of the carriage beyond the desired position. The motor is automatically cut off at the upper and lower limits of the carriage travel by means of limit switches 49 and 50 mounted upon one of the rails 10 and operative by rollers 51 which are engaged by adjustable contact brackets 52 and 53 secured at 54 to the side bar 17 as best shown in Fig. 3. Thus, as the carriage levels with either the upper or lower floors, the power will be automatically shut off in order to level the platform 14 in loading or unloading positions.

The carriage frame also includes tie bars or angles 55 which are secured to the cross bar 42 and converge in a forward direction, being secured at their forward ends at 56 to the transmission unit 31. When the angle of the rails 10 is changed, the only carriage changes required in order to keep the platform 14 level, is a change in the length of these tie bars 55 and the brace bars 20, as will be understood.

Current is supplied to the motor 26 through a conventional trolley arrangement consisting of a pair of enclosed and protected bus bars 57 secured by brackets 58 to one of the rails 10 and engaged by a travelling trolley 59 which is carried by bracket 60 upon the carriage 11. Flexible conductors 61 lead from the trolley 60 to the motor and this entire mechanism being entirely conventional in construction need not be further described herein. It will, of course, be understood further that a conventional reversing switch as indicated at 62 in Fig. 1 is employed in order to reverse the direction of rotation of the motor.

An important feature of our present invention resides in the provision of a fail-safe mechanism operative upon the failure of either cable 37 or 38 to immediately shut off or stop the motor 26 and lock the carriage 11 to both of the rails 10. This mechanism comprises a rock shaft 63 journaled across the side bars 17 in bearing bracket 64 and carrying sharply pointed dogs 65 at its outer ends. These dogs are thus aligned with the forward surfaces of the rails 10 and they may be swung downwardly and rearwardly from their normal positions illustrated by dotted lines in Fig. 5 by means of a retractile coil spring 66 which is stretched between the lower end of an arm 67 upon the shaft 63 and a finger 68 secured to the adjacent lower roller shaft 24. As shown in full lines in Fig. 5 this movement of the dog 64 by the spring 66 will cause the pointed ends of the dogs to bite into the faces of the rails and positively lock the carriage thereto against downward movement. The arm 67 also extends upwardly from the shaft 63 and is normally engaged by the hooked forward end of a latch 69 which is pivoted at 70 to a bracket 71 carried by cross bars 72 connecting the side bars 17. When the latch 69 is thus engaged it will hold the dog 65 clear of the rails to permit the desired upward and downward movements of the carriage.

The latch 69 is controlled or operated by mechanism which senses or is responsive to the tension of the cables 37 and 38, and which comprises an equalizing bar 73 positioned cross wise some distance from the latch, above the tie bars 55 previously described. Near the ends of the equalizing bar 73 support rods 74 are secured in place and depend loosely down through suitable apertures in the tie bars 55 below which coil springs 75 are placed upon the rods in order to normally bias both ends of the equalizing bar in a downward direction. The tension of the springs 75 may be adjusted by nuts 76 threaded upon the lower ends of the rods 74 and the tension is so adjusted that pulleys 77 journaled at the ends of the equalizing bar will be engaged with the cables 37 and 38, between the winch drums 35 and 36 and the pulleys 39 and 40, with such force as to slightly bend the cables downward as they pass between these points. Thus it will be evident that so long as the cables 37 and 38 remain taut, the equalizing bar 73 will be held in an upper position but upon the failure of either cable the bar will be moved downwardly, at its center, by the springs 75. This downward movement of the equalizing bar is made use of by means of an actuating rod 78 to release the latch 69 and for this purpose the rod 78 extends downwardly into a position for engaging the rear end of the latch as indicated in Figs. 3 and 5. In the normal position of the equalizing bar, however, the actuating bar 78 will stand free of the latch 69, so that the latter will remain in engagement with the arm 67 in order to hold the dog 65 clear of the rails. The actuating rod 78 also depends through a motor cut off switch unit indicated at 79 which is secured to the cross bars 72 and connected in circuit to the motor 26. As long as the equalizing bar 73 remains in its normal elevated position the cut off switch 79 will be closed so as not to interfere with the normal starting and stopping of the motor. The switch is so constructed, however, that the downward movement of the actuating rod 78 when a cable failure occurs will immediately open the circuit to the motor bringing it to a halt.

It will now be understood that a cable failure will not only immediately engage the dogs 65 with the rails 10 in order to hold the carriage at any level at which such failure occurs, but that the power to the motor will also be cut off concurrently in order to prevent any damage to the parts. After each such operation of the fail-safe mechanism it will, of course, be necessary to reset the same by manually re-engaging the latch 69 after the cables have been repaired. The safety mechanism is thus seen to be not only simple in its construction and operation but so arranged as to immediately sense a reduction in tension of either cable in order to meet all safety requirements in devices of this nature.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described our invention, what we claim to be new and desire to protect by Letters Patent is:

1. A cargo lift of the character described, comprising a pair of spaced upright rails, a carriage supported on the rails for travel upwardly and downwardly therealong, cables secured at the upper ends of the rails and extending therefrom down to the carriage, power operated drums on the carriage to wind up or pay out the cables and thereby move the carriage up and down respectively, and safety means operated by the tautness of the cables to shut off the power to the drums when either cable slackens.

2. A cargo lift of the character described, comprising a pair of spaced upright rails, a carriage supported on the rails for travel upwardly and downwardly therealong, cables secured at the upper ends of the rails and extending therefrom down to the carriage, power operated drums on the carriage to wind up or pay out the cables and thereby move the carriage up and down respectively, safety means operated by the tautness of the cables to shut off the power to the drums when either cable slackens, and stop means operated between the carriage and rails by said safety means to automatically and instantly stop the carriage as either cable slackens.

3. In a cargo lift of the character described, a pair of generally upright spaced rails, a carriage having rollers engaging said rails, cables secured to the upper ends of the rails, a motor operated winch mechanism on the carriage and operating the cables to pull the carriage up the rails or pay out the cable whereby the carriage may descend, the improvement which comprises a fail-safe mechanism including dogs adapted to engage the rails, a shaft on the carriage carrying said dogs and spring biased to normally engage the dogs with the rails, latch means operative to hold the dogs clear of the rails, and means operated in response to cable tension to operate said latch means.

4. In a cargo lift of the character described, a pair of generally upright spaced rails, a carriage having rollers engaging said rails, cables secured to the upper ends of the rails, a motor operated winch mechanism on the carriage and operating the cables to pull the carriage up the rails or pay out the cable whereby the carriage may descend, the improvement which comprises a fail-safe mechanism including dogs adapted to engage the rails, a shaft on the carriage carrying said dogs and spring biased to normally engage the dogs with the rails, a latch operative to hold the dogs clear of the rails, and means including an equalizer mechanism engaging the cables for operating the latch and releasing same in response to a decrease or failure in cable tension.

5. In a cargo lift of the character described, a pair of generally upright spaced rails, a carriage having rollers engaging said rails, cables secured to the upper ends of the rails, a motor operated winch mechanism on the carriage and operating the cables to pull the carriage up the rails or pay out the cable whereby the carriage may descend, the improvement which comprises a fail-safe mechanism including dogs adapted to engage the rails, a shaft on the carriage carrying said dogs and spring biased to normally engage the dogs with the rails, an arm on said shaft, a latch normally engaging the arm to hold the dogs clear of the rails, an equalizer bar supported on the carriage and having rollers engaging the cables, and means carried by the equalizer bar to trip and release the latch upon a failure of the cables.

6. In a cargo lift of the character described, a pair of generally upright spaced rails, a carriage having rollers engaging said rails, cables secured to the upper ends of the rails, a motor operated winch mechanism on the carriage and operating the cables to pull the carriage up the rails or pay out the cable whereby the carriage

may descend, the improvement which comprises, a fail-safe mechanism including dogs adapted to engage the rails, a shaft on the carriage carrying said dogs and spring biased to normally engage the dogs with the rails, an arm on the shaft, a latch normally engaging the arm to hold the dogs clear of the rails, a support on the carriage, an equalizer bar loosely mounted on the support and having an actuating rod for engaging the latch, means biasing the equalizer bar downward to disengage the latch from the arm, and rollers on the equalizer bar resting on the cables and normally holding said actuating rod upward free of the latch.

7. In a cargo lift of the character described, a pair of generally upright spaced rails, a carriage having rollers engaging said rails, cables secured to the upper ends of the rails, a motor operated winch mechanism on the carriage and operating the cables to pull the carriage up the rails or pay out the cable whereby the carriage may descend, the improvement which comprises a fail-safe mechanism including dogs adapted to engage the rails, a shaft on the carriage carrying said dogs and spring biased to normally engage the dogs with the rails, an arm on the shaft, a latch normally engaging the arm to hold the dogs clear of the rails, a support on the carriage, an equalizer bar loosely mounted on the support and having an actuating rod for engaging the latch, means biasing the equalizer bar downward to disengage the latch from the arm, rollers on the equalizer bar resting on the cables and normally holding said actuating rod upward free of the latch, and a motor cut-off switch operated by said actuating rod to stop the motor as the latch is released.

8. In a cargo lift of the character described, a pair of generally upright spaced rails, a carriage having rollers engaging said rails, cables secured to the upper ends of the rails, a motor operated winch mechanism on the carriage and operating the cables to pull the carriage up the rails or pay out the cable whereby the carriage may descend, the improvement which comprises a fail-safe mechanism including dogs adapted to engage the rails, a shaft on the carriage carrying said dogs and spring biased to normally engage the dogs with the rails, an arm on the shaft, a latch normally engaging the arm to hold the dogs clear of the rails, a support on the carriage, an equalizer bar loosely mounted on the support and having an actuating rod for engaging the latch, means at each end of the equalizer bar biasing the same in a downward direction to release said latch, and means on the ends of the equalizer bar resting on the cables to hold the actuating rod in an upper position so long as the cables are both taut.

9. In a cargo lift of the character described, a pair of generally upright spaced rails, a carriage having rollers engaging said rails, cables secured to the upper ends of the rails, a motor operated winch mechanism on the carriage and operating the cables to pull the carriage up the rails or pay out the cable whereby the carriage may descend, the improvement which comprises a solenoid brake on the motor to stop the winch mechanism when power to the motor is cut off and prevent overrunning of the carriage.

10. In a cargo lift of the character described, a pair of generally upright spaced rails, a carriage having rollers engaging said rails, cables secured to the upper ends of the rails, a motor operated winch mechanism on the carriage and operating the cables to pull the carriage up the rails or pay out the cable whereby the carriage may descend, the improvement which comprises a fail-safe mechanism including dogs adapted to engage the rails, a shaft on the carriage carrying said dogs, and means connected to said shaft and having grooved rollers riding the cables operative when a cable loosens to initiate movement of the shaft to set said dogs against the rails.

11. In a cargo lift of the character described, a pair of generally upright spaced rails, a carriage having rollers engaging said rails, cables secured to the upper ends of the rails, a motor operated winch mechanism on the carriage and operating the cables to pull the carriage up the rails or pay out the cable whereby the carriage may descend, the improvement which comprises a fail-safe mechanism including dogs adapted to engage the rails, a shaft on the carriage carrying said dogs, means connected to said shaft and having grooved rollers riding the cables operative when a cable loosens to initiate movement of the shaft to set said dogs against the rails, and a motor cut-off switch operatively arranged for actuation by said last mentioned means to also stop the motor as the dogs are applied to the rails.

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