

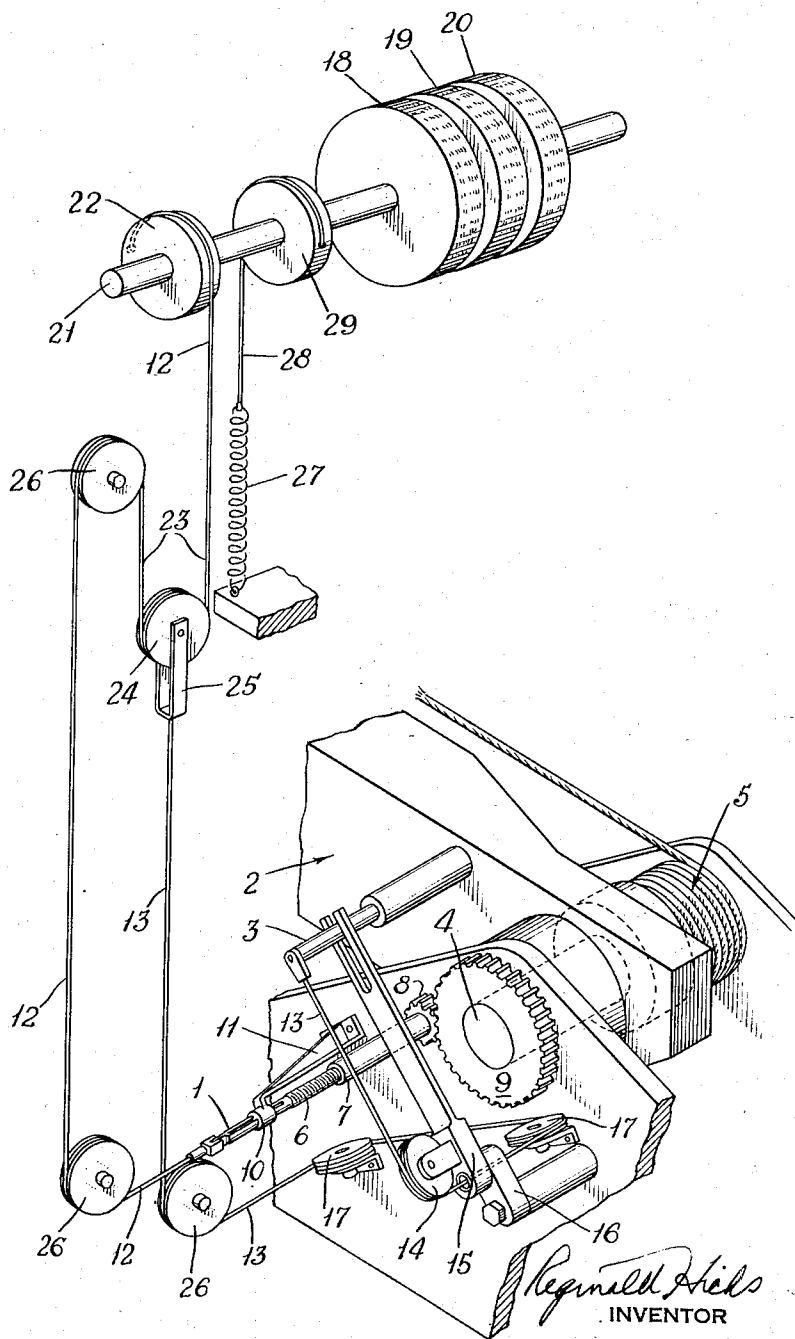
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SAFE LOAD INDICATOR

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SAFE LOAD INDICATOR

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In order to safeguard the lives of firemen and other users of aerial ladders, such as are mounted on fire department trucks, it has been proposed to provide an automatic, safe-load indicator adapted to respond to the maneuvering of the ladder and to enable the operator to tell, by a glance at a scale, the maximum load which can safely be applied to the ladder at any extension and elevation.

As with all apparatus which is apt to be put to use under emergency conditions, it is of the utmost importance that the indicator mechanism be of a character to operate reliably and with a minimum of attention and maintenance; and it is the primary object of this invention to supply that need and in a mechanism so organized that it can be readily applied to turntable ladders in the limited space usually available.

Other objects and advantages of the invention will be apparent from the following description and accompanying drawings of the preferred form of the invention, the single figure being a perspective, partly schematic view of the indicator mechanism and related ladder parts.

In the illustrated installation, the indicator mechanism and its differential drive are adapted for actuation by two independently movable means which are associated with the ladder and are responsive, respectively, to its raising and lowering and to its extension and retraction. The specific details of such means form no part of the present invention and as described are simply illustrative.

One of such means is shown as consisting of a shaft 1 adapted, as below described, to move axially in one direction or the other as ladder 2 (of which the lower end portion only of one of the side rails is illustrated) is extended or retracted. The other of such means is shown as consisting of a post 3 projecting laterally from the ladder so as to be swung in an arc as the ladder is raised and lowered about the axis of shaft 4, which latter is schematically illustrated as comprising the shaft which carries the ladder extension cable and drum, generally designated 5.

The axial movement of shaft 1 is effected by the engagement of an externally threaded portion 6 of the shaft with an internally threaded shaft 7 adapted to be rotated by pinion 8 from gear 9 mounted on cable drum shaft 4. Shaft 1 is held against rotation, as by the engagement with a slot in the shaft of a key carried by a collar 10 which is supported by fixed bracket 11. Thus, as above stated, shaft 1 is moved axially, in one direction or the other, as the cable drum shaft

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is rotated by the usual drive mechanism (not shown) to extend or retract the ladder. To the end of shaft 1 is secured a cable 12, which is one of two cables by which the indicator mechanism is actuated.

The other actuating cable, 13, is secured to post 3 and the arcuate movement of the post as the ladder is raised and lowered about the axis of shaft 4 is applied to operate this cable by training the latter over a pulley 14 carried by an arm 15 mounted to swing about a different axis from that about which the ladder pivots. Arm 15, the forked end of which straddles post 3, is pivotally mounted on the end of a fixed bracket arm 16 and the cable 13, as indicated, is passed along the pivot axis of arm 15 and over other appropriate guide pulleys 17. As the ladder is raised and lowered about its pivot axis, the post 3 approaches and recedes from the pivot axis of arm 15, so that the end of cable 13 attached to the post is moved toward and from pulley 14. Cable 13 thus responds to the raising and lowering of the ladder, just as cable 12 responds to its extension and retraction, and each independently of the other.

The indicator, which may consist of any appropriately calibrated device movable to show the varying safe load limits as the ladder is operated, is shown as consisting of a series of three drums 18, 19, 20 the peripheries of which carry the load limit indications which may be observed, as through windows in a suitable cover panel (not shown). Drum 18 may serve to indicate the safe load limits when the ladder is in use with its upper end supported, as against a building, drum 19 when the ladder is in use as a water tower, and drum 20, when the ladder is in use with its upper end unsupported, but not as a water tower. Appropriately calibrated, all three drums may be secured to a single indicator shaft 21.

One of the indicator actuating cables is coupled to the indicator shaft so as to rotate it in response to ladder movement. In this instance the cable 12 is shown wrapped around and fastened to a collar or small pulley 22 secured to shaft 21.

The other cable, 13, is connected to an actuator device arranged to function, through cable 12, also to rotate the indicator shaft. As shown and as is preferred, cable 12 incorporates a depending loop 23 in which is seated a floating pulley 24, and suspended from the pulley is a yoke 25 to which cable 13 is fastened. Fixed guide pulleys are indicated at 26; and a single spring 27, having a

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cable connection 28 to indicator shaft pulley 29, serves to bias the shaft in a direction opposite to the pull of cable 12, so as to tension the latter. The spring also serves to sustain the floating pulley and maintain cable 13 under tension.

It will be apparent that, as the result of this arrangement, the extension and retraction of the ladder is applied directly to rotate the indicator shaft through the medium of cable 12; that the shaft is also rotated by the rising and falling of floating pulley 23 as the ladder is raised and lowered about its pivot axis (each of these operations being free to take place independently of the other) and that the cables are also free to operate conjointly or differentially to register simultaneous adjustment of the ladder, both as to raising and as to extension.

In the perspective drawing the components have been spread out for clearness of illustration but it will be recognized that, by the use of a system operating in accordance with the principles of the mechanism described, the indicator control mechanism can be accommodated in a very limited space and particularly one of the narrow width as most appropriate for mounting on an aerial ladder turntable adjacent the operator's station. Also, the cable and pulley type of control described incorporates a minimum of moving parts and is characterized by the complete absence of delicate components requiring careful maintenance to insure reliable operation.

In the light of the foregoing description, the following is claimed:

1. In a safe load indicator for an aerial ladder having two means independently movable, respectively, in response to the raising and lowering and to the extension and retraction of the ladder, and an indicator shaft: the combination of a cable wrapped around the shaft and having a remote end connected to one of said means, an intermediate stretch of the cable including a depending loop, a pulley seated in said loop, a second cable having one end connected to the pulley and its other end connected to the other of said means, and a spring coupled to the indicator shaft and biased to rotate the same in a direction to keep both of the said cables taut.

2. In a safe load indicator for an aerial ladder having two means independently movable, respectively, in response to the raising and lowering and to the extension and retraction of the ladder, and an indicator shaft: the combination of a cable coupled to the indicator shaft to rotate the same and having one of its ends connected to one of said movable means, and a floating pulley having connections to and bodily movable by the other of said movable means, the said pulley engaging a loop of the cable intermediate the said end thereof and the indicator shaft, and a spring coupled to the indicator shaft and biased to counterbalance the said pulley and to rotate the indicator shaft in the reverse direction to that effected by tension of the said cable.

3. In a safe load indicator for an aerial ladder having two means independently movable, respectively, in response to the raising and lowering and to the extension and retraction of the ladder, and a movable indicator: the combination of a cable coupled to the indicator and having one of its ends connected to one of said movable means, and a floating pulley having connections to and bodily movable by the other of said movable means, the said pulley engaging a loop of the cable intermediate the said end thereof and the indicator, and a spring biased to counterbalance

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the said pulley and to move the indicator in the reverse direction to that effected by tension of the said cable.

4. In a safe load indicator for an aerial ladder, the combination of two independently movable means connected to the ladder, said means being independently movable, respectively, in response to the raising and lowering and to the extension and retraction of the ladder, a rotatable indicator shaft, an indicator carried by said shaft, a single continuous cable having one end connected to the indicator shaft and its other end connected to one of said movable means, an intermediate stretch of said cable including a depending loop, a pulley seated in said loop a second cable having one end connected to said pulley and its other end connected to the other of said movable means, and a spring coupled to the indicator shaft and biased to counterbalance the said pulley and to rotate the indicator shaft in a direction opposite to the pull of the first-mentioned cable.

5. A safe load indicator for an aerial ladder including two independently movable means associated with the ladder, said means being independently movable, respectively, in response to the raising and lowering of the ladder and to the extension and retraction of the ladder, a rotatable indicator shaft, and indicator drum carried by said shaft, a calibrated scale associated with said indicator drum, said scale indicating by direct reading the maximum safe load for the ladder, a cable having one end thereof wrapped around the indicator shaft and the other end thereof connected to and movable in response to movement of one of the two independently movable means, a floating pulley engaging with said cable intermediate its ends, a second cable connecting the pulley to the other of said independently movable means, said second cable being movable in response to movement of the last-mentioned movable means and a counter-balance connected to the indicator shaft, said counter-balance urging the indicator shaft in a direction to keep both of said cables taut.

6. In a safe load indicator for an aerial ladder, the combination of two independently movable means connected to the ladder, said means being independently movable, respectively, in response to the raising and lowering of the ladder and to the extension and retraction of the ladder, a rotatable indicator shaft, a plurality of indicator drums carried by said shaft, each of said drums having a calibrated scale associated therewith for indicating by direct reading the maximum safe load for the ladder under differing load conditions, a cable having one end thereof wrapped around the indicator shaft with its other end connected to one of the two independently movable means and being movable thereby, a floating pulley engaging with said cable intermediate its ends, a second cable connecting said pulley to the other of said independently movable means, said second cable being movable in response to movement of the last-mentioned movable means, and a counter-balance connected to the indicator shaft, said counter-balance urging the indicator shaft in a direction to keep both of said cables taut.

7. In a safe load indicator for an aerial ladder of the type that is supported at one end on a base with the other end being free for elevation and extension to different positions, the combination of an axially movable member connected to the ladder, said member being movable in response to the extension and retraction of the

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ladder, an angularly movable member carried by the ladder, said angularly movable member being movable in response to the raising and lowering of the ladder, a movable indicator, a cable having one end connected to said indicator and its other end connected to one of the movable members, a pulley engaging said cable intermediate its ends and a second cable having one end connected to said pulley and its other end connected to the other of said movable members.

8. In a safe load indicator for an aerial ladder of the type that is supported at one end on a base with the other end being free for elevation and extension to different positions, the combination of an axially movable member connected to the ladder, said member being movable in response to the extension and retraction of the ladder, an angularly movable member carried by the ladder, said member being pivotally movable about the fixed end of the ladder in response to the raising and lowering of the ladder, a rotatable indicator shaft, an indicator carried by said shaft, a calibrated scale associated with said indicator, said scale being calibrated to indicate by direct reading the maximum safe load for the free end of the ladder at different elevations and extensions of the ladder, a single continuous cable having one end wrapped around said indicator shaft and its other end secured to one of the movable members, a pulley engaging with said cable intermediate its ends, and a second cable having one end connected to said pulley and its other end connected to the other of said members.

9. In a safe load indicator for an aerial ladder of the type that is supported at one end on a base with the other end being free for elevation and extension to different positions, the combination of an axially movable member connected to the ladder, said member being movable in response to the extension and retraction of the ladder, an angularly movable member carried by the ladder, said member being pivotally movable about the fixed end of the ladder in response to the raising and lowering of the ladder, a rotatable indicator shaft, an indicator carried by said shaft, a calibrated scale associated with said indicator, said scale being calibrated to indicate by direct reading the maximum safe load for the free end of the ladder at different elevations and extensions of the ladder, a single continuous cable having one end wrapped around said indicator shaft and its other end secured to one of the movable members, a pulley engaging with said cable intermediate its ends, a second cable having one end connected to said pulley and its other end connected to the other of said movable members, and a spring coupled to said indicator shaft, said spring being biased to rotate the indicator shaft in a direction opposite to the pull of the cables.

10. In a safe load indicator for an aerial ladder of the type that is supported at one end on a base with the other end being free for elevation and extension to different positions, the combination of an axially movable member connected to the ladder, said member being movable in response to the extension and retraction of the ladder, an angularly movable member carried by the ladder, said member being pivotally movable about the fixed end of the ladder in response to the raising and lowering of the ladder, a rotatable indicator shaft, a plurality of indicator drums

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carried by said shaft, each of said drums having a different calibrated scale associated therewith with each of the respective scales indicating the maximum safe load for the free end of the ladder under a different load condition, a single continuous cable having one end wrapped around said indicator shaft and its other end secured to one of the movable members, a pulley engaging with said cable intermediate its ends, and a second cable having one end connected to said pulley and its other end connected to the other of said members.

11. In a safe load indicator for an aerial ladder having two means independently movable, respectively, in response to the raising and lowering and to the extension and retraction of the ladder, the combination of a rotatable indicator shaft, a cable coupled to the indicator shaft for rotating the same in one direction and having one of its ends connected to one of the independently movable means, a floating pulley connected to and bodily movable by the other of said independently movable means, said pulley engaging a loop in the cable intermediate the said end thereof and the indicator shaft, counter-balancing means connected to the indicator shaft, said counter-balancing means tending to rotate the indicator shaft in a direction opposite to the rotation thereof by the cable and indicating means connected to and movable by rotation of the indicator shaft in either direction, said indicating means including a calibrated scale, said scale being calibrated to indicate the maximum safe load for the ladder.

12. In a safe load indicator for an aerial ladder having two means independently movable, respectively, in response to the raising and lowering and to the extension and retraction of the ladder, the combination of a rotatable indicator shaft, a cable coupled to the indicator shaft for rotating the same in one direction and having one of its ends connected to one of the independently movable means, a floating pulley connected to and bodily movable by the other of said independently movable means, said pulley engaging a loop in the cable intermediate the said end thereof and the indicator shaft, counter-balancing means connected to the indicator shaft, said counter-balancing means tending to rotate the indicator shaft in a direction opposite to the rotation thereof by the cable and indicating means connected to and movable by rotation of the indicator shaft in either direction, said indicating means including a plurality of calibrated scales, each of said scales being calibrated to indicate by direct reading the maximum safe load for the ladder under a different load condition.

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