

April 5, 1960

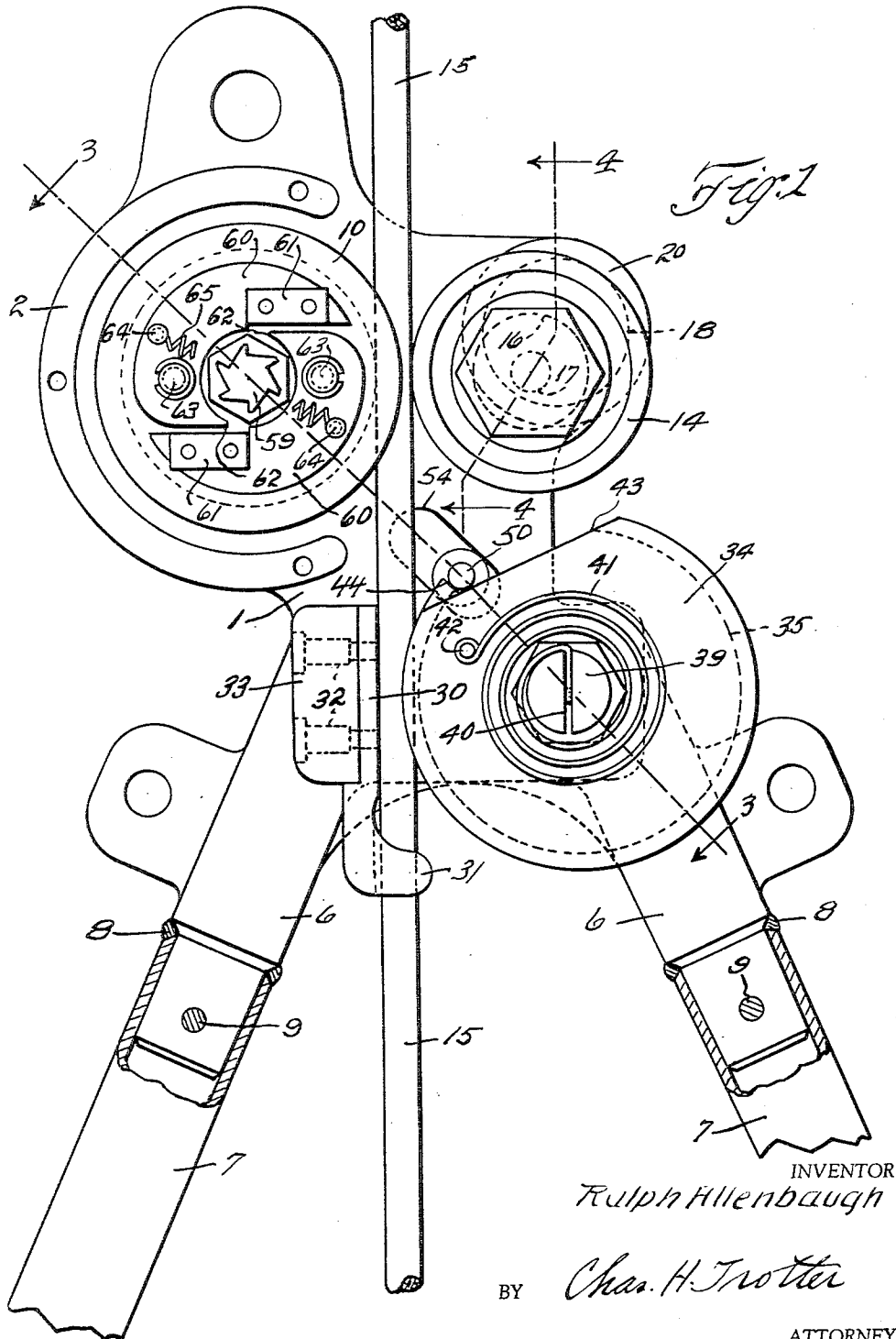
R. ALLENBAUGH

2,931,466

SAFETY LOCKING MECHANISM

Filed April 1, 1958

3 Sheets-Sheet 1



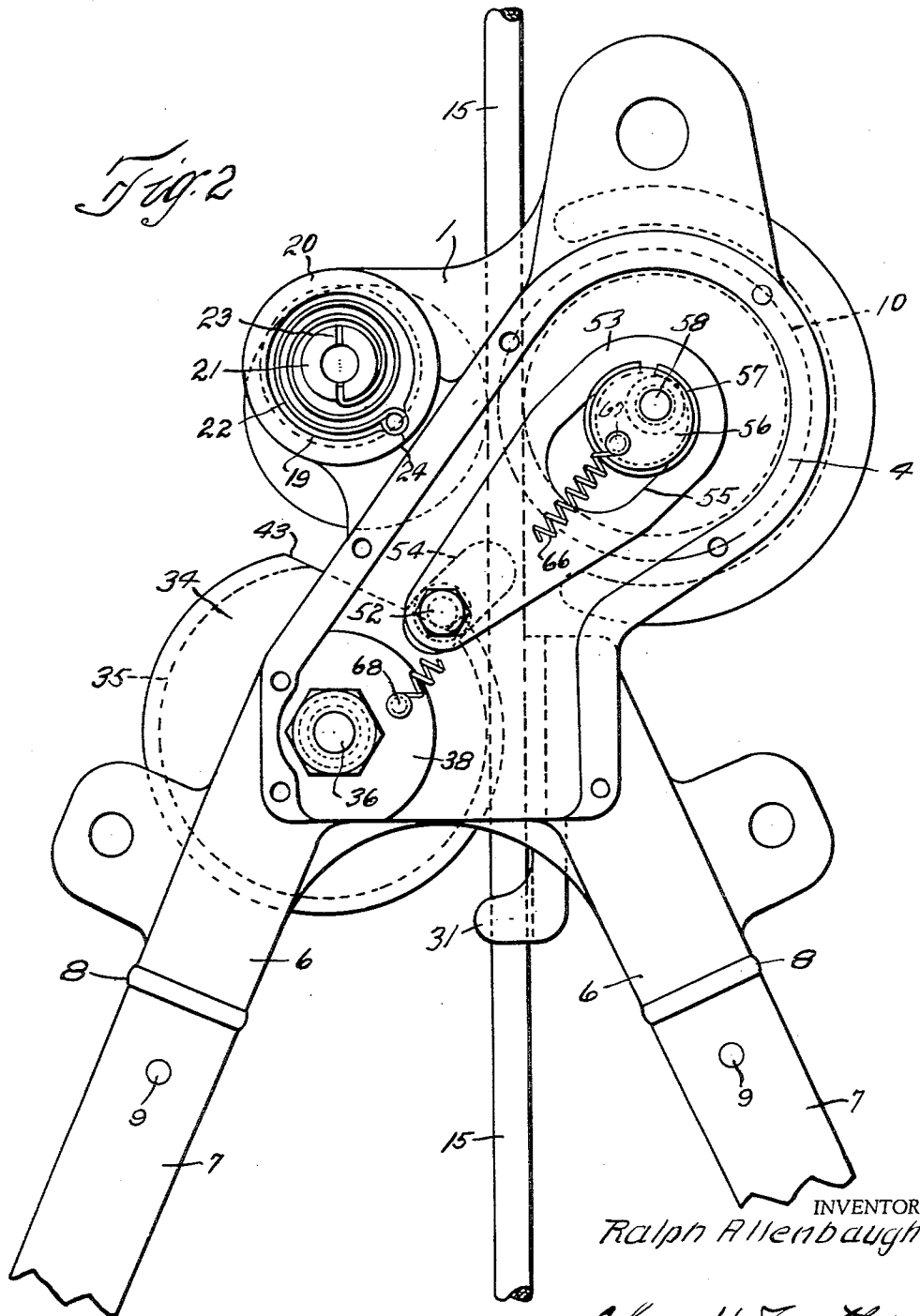
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INVENTOR
Ralph Allenbaugh

BY

Chas. H. Trotter

ATTORNEY

April 5, 1960

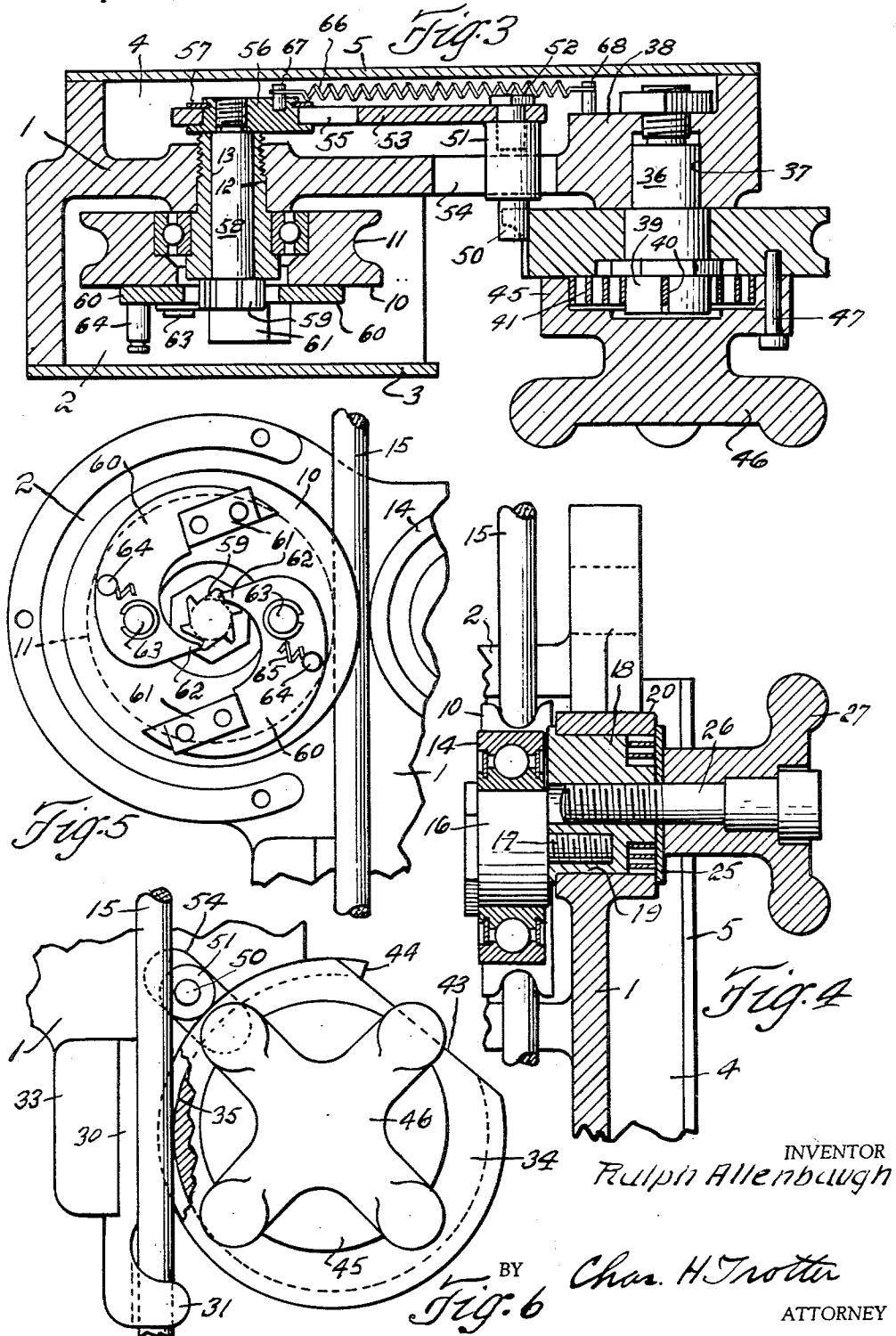
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3 Sheets-Sheet 3



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SAFETY LOCKING MECHANISM

Ralph Allenbaugh, Crestline, Ohio

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4 Claims. (Cl. 188—188)

This invention relates to a safety locking mechanism for power actuated hoisting mechanisms for swing stage scaffolds such as shown in my copending application Serial No. 725,561 which was filed concurrently herewith, and in Patents No. 2,662,732, No. 2,662,733 and No. 2,662,734, which were issued in my name on December 15, 1953. But although the locking mechanism of the invention was especially designed for use in connection with swing stage scaffolds, it is equally well adapted for use in connection with other power actuated hoisting mechanisms which in effect climb up and down a single strand of suspended cable.

Power operated swing stage scaffolds comprise generally a pair of stirrups by and between which a plank is supported. Each stirrup has a power operated hoisting mechanism mounted thereon by which the scaffold is moved up and down a pair of suspended cables. The cables extend down through a cable guides, which are mounted on the stirrups at the upper ends thereof, into operative engagement with the hoisting mechanisms. The hoisting mechanisms are so constructed that they must be positively actuated during both raising and lowering of the scaffold and will hold the scaffold stationary in set position when not actuated. But if the hoisting mechanism becomes so disabled that it cannot hold the scaffold in set position the scaffold will fall by gravity unless some safety locking means is provided on each stirrup by which a stirrup is clamped to the associated cable in the event of any such failure.

It is therefore the principal object of this invention to provide such a safety locking means which is fully automatic in operation.

Another object of the invention is to provide a locking mechanism of the aforesaid character which is fast and positive in action and will firmly clamp a stirrup to its cable the instant the scaffold starts to fall.

Still another object of the invention is to provide a locking mechanism of the aforesaid character that is of relatively simple construction and unlikely to get out of order.

In accordance with my invention, I incorporate the safety locking mechanism in the cable guide means which is secured to a stirrup adjacent the upper end thereof in spaced relation above a hoisting mechanism thereon. The cable guide means and the incorporated locking mechanism are mounted on a base plate which is secured to the upper ends of the converging side members of a swing stage scaffold stirrup. The guiding and locking mechanism comprises generally a grooved guide pulley which is mounted on the base plate for rotation about a fixed axis, and a pressure roller which is eccentrically mounted on the base plate in opposed relation to the guide pulley. A clamping block is mounted on the base plate below the guide pulley, and a grooved clamping pulley is eccentrically mounted on the base plate in opposed relation to the clamping block. The cable extends vertically downwardly between the guide pulley and the pressure roller, and between the clamping block and

2

the clamping pulley. The eccentrically mounted pressure roller is yieldingly spring biased into contact with the cable which maintains the cable in firm contact with the guide pulley within the groove thereof. The guide pulley will therefore be rotated by the cable during movement of the mechanism up and down the cable.

The clamping pulley is normally held out of contact with the cable by a latching pin, but is adapted to be spring rotated into engagement with the cable upon withdrawal of the latching pin from latching position.

The guide pulley is rotatably mounted upon a fixed stud having an axial bore therethrough in which a short shaft is rotatably mounted. This shaft has a ratchet wheel secured to the forward end thereof and a circular disk eccentrically connected to the rear end thereof. A pair of weighed arms which are pivotally mounted on the outer face of the guide pulley are each provided with a pawl which is adapted to engage the ratchet wheel under abnormal conditions. The pawls are normally held out of engagement with the ratchet wheel by a coiled spring which is connected to and between the two arms.

The latching pin is secured to one end of a shiftable link having an elongated slot therein in which the eccentrically mounted disk is disposed.

During normal rate of movement of the mechanism up and down the cable the locking mechanism is ineffective. But if the mechanism moves down the cable at greater than a predetermined rate, the weighted pivoted arms on the guide pulley will fly out by centrifugal force and bring the pawls into engagement with the ratchet wheel. The ratchet wheel, shaft therefor, and the eccentrically mounted disk thereon, will then all be rotated by the guide pulley which will shaft the latching pin link and withdraw the latching pin out of latching engagement with the clamping pulley. The clamping pulley will then be rotated, by the incorporated spring means, into engagement with the cable, which due to the eccentric mounting of the clamping pulley will cause it to firmly clamp the cable between the clamping pulley and the clamping block. And the greater the weight of or on the scaffold the tighter the cable will be gripped.

Having stated the principal objects of the invention other and more limited objects thereof will be apparent from the following specification and the accompanying drawings forming a part thereof in which:

Fig. 1 is a front elevation of a safety locking mechanism, constructed according to my invention, showing it with the front housing cover removed;

Fig. 2 is a rear elevation thereof, with the rear housing cover removed;

Fig. 3 is a transverse section taken on the lines 3—3 of Fig. 1;

Fig. 4 is a transverse vertical section taken substantially on the line 4—4 of Fig. 1;

Fig. 5 is a fragmentary detail view in front elevation showing the manner in which the weighted arms are thrown out by centrifugal force to bring the pawls carried thereby into operative engagement with the ratchet wheel when the guide pulley is rotated in a counter-clockwise direction at greater than a predetermined rate; and

Fig. 6 is a fragmentary detail view in front elevation showing the latching pin moved out of latching engagement with the clamping pulley and the clamping pulley rotated into clamping engagement with the cable.

Referring now to the drawings by reference characters, the numeral 1 indicates a base plate having a housing 2 on the front thereof, which is open at one side thereof and is provided with a removable cover 3; and a housing 4 on the rear thereof which is provided with a removable cover 5. The base plate 1 has a pair of downwardly diverging legs 6, cast integrally therewith, by which the

base plate is secured to a swing stage scaffold stirrup. As shown in Figs. 1 and 2 the legs 6 are inserted into the upper ends of the converging tubular side bars 7 of a stirrup and welded and pinned thereto as indicated at 8 and 9.

A guide pulley 10, having a peripheral groove 11 is rotatably mounted, within the housing 2, upon a pivot stud 12 which is removably screwed into a threaded aperture in the base plate 1. The pivot stud 12, which is provided with an axial bore 13, extends out through the aperture with rear end disposed slightly beyond the rear face of the plate 1 within the housing 4. A pressure roller 14 which is eccentrically mounted adjacent the guide pulley 10, in substantially horizontal alignment therewith, is yieldingly biased toward the guide pulley 10. The suspended supporting cable 15, up and down which the hoisting mechanism is moved, extends vertically downwardly between the guide pulley 10 and the pressure roller 14 which is operative to firmly press the cable 15 into engagement with the guide pulley 10 within the groove 11 thereof. The guide pulley 10 will thereby be rotated by the cable 15 as the hoisting mechanism moves up and down the cable.

The pressure roller 14, which consists of a standard scaled type ball bearing, is mounted upon a hub 16 which is eccentrically secured, by a threaded stud 17, to the forward end of a cylindrical bushing 18 which is rotatably mounted in a bore 19 through a boss 20 on the base plate 1. The bushing 18 at the rear end thereof is provided with a reduced slotted cylindrical extension 21 around which a helical spring 22 is mounted within the bore 19. The inner end of the spring 22 is secured in the slot 23 in the extension 21, and the outer end of the spring is secured in a notch 24 in the bore 19. The spring 22 is held in position by a washer 25 which closes the rear end of the bore 19 and is mounted on a bolt 26 by which a hand-wheel 27 is removably secured to the bushing 18. From this it will be seen that the spring 22 will rotate the bushing 18 in a direction, clockwise as viewed in Fig. 1, to move the axis of the pressure roller 14 eccentrically mounted thereon toward the cable 15 and will yieldingly hold the pressure roller in contact with the cable. The hand-wheel 27 is provided to rotate the bushing 18 in the opposite direction against the tension of the spring 22 and thereby move the pressure roller out of contact with the cable when it is desired to remove the cable from or apply it to the mechanism.

A clamping block 30, having a pair of cable guide ears 31 on the lower end thereof, is removably secured by screws 32 to a lug 33 on the base plate 1 below the housing 2. A clamping pulley 34, having a peripheral groove 35, is eccentrically mounted on a pivot stud 36 adjacent the clamping block 30. The cable 15 extends down from the guide pulley 10 between the clamping block 30 and the clamping pulley 34, and then down between the cable guide ears 31. The cable 15 is disposed in sliding contact with the face of the clamping block 30 and within the groove 35 of the clamping pulley 34, but normally out of contact therewith as shown in Fig. 1. The clamping pulley 34, due to its eccentric mounting on the pivot stud 36, is operative when rotated clockwise, as viewed in Fig. 1, to grip and tightly clamp the cable 15 between the clamping block 30 and the clamping pulley 34.

The pivot stud 36 is rigidly secured in an aperture 37 in a boss 38 on the base plate 1, and is provided with an outwardly extending cylindrical extension 39 which is slotted as indicated at 40. A helical spring 41 is mounted on the forward face of the clamping pulley with the inner end thereof secured in the slot 40 and the outer end thereof secured to a pin 42 carried by the clamping pulley 34. The spring 41 is operative to rotate the clamping pulley, clockwise as viewed in Fig. 1, into contact with the cable 15, and thereby, as previously stated, grip and clamp the cable 15 tightly between the clamping block 30 and the clamping pulley 34 thereby preventing further movement

of the mechanism down the cable 15. Obviously the greater the weight of the mechanism and persons and/or material supported thereby the tighter the cable will be clamped between the clamping block 30 and the clamping pulley 34. The pulley 34 has a sector cut therefrom as indicated at 43 to provide clearance between the pulley 34 and the cable 15 when removing the cable from or replacing the cable on the mechanism. The clamping pulley 34 is also provided with an abutment 44 at one end of the cut away sector. The spring 41 is enclosed within the hub 45 of a hand-wheel 46 which is secured to the clamping pulley 34 against the tension of the spring 41 when re-setting the clamping pulley 34 after actuation or when removing or applying the cable.

The clamping pulley 34 is normally held against rotation out of engagement with the cable 15 by a latching pin 50 which is adapted to be engaged by the abutment 44. The latching pin 50 is secured to the forward end of a short cylindrical stud 51 which is secured by a screw 52 to one end of a shiftable link 53 within the rear housing 4. The stud 51 extends through and is slidably mounted in an elongated slot 54 through the base plate 1, by which the latching pin 50 is held in operative position for engagement by the abutment 44 and is guided to and from operative position. The link 53 is provided with an elongated slot 55 within which a flanged eccentric disk 56 is secured by a snap ring 57. The disk 56 is eccentrically secured to the rear end of a stub shaft 58, which is rotatably mounted in the bore 13 through the pivot stud 12, and has a ratchet wheel 59 secured to the forward end thereof.

A pair of similar centrifugally actuated arms 60, having weights 61 secured to one end thereof and pawls 62 secured to the other ends thereof, are pivotally mounted on pivot pins 63 which are secured to and extend outwardly from the front face of the guide pulley 10. The arms 60 are provided with outwardly extending pins 64 to and between which a coiled spring 65 is secured. When the guide pulley is rotated counter-clockwise, as viewed in Figs. 1 and 5, at greater than a predetermined speed, which is determined by the tension of the spring 65, the arms 60 will be centrifugally thrown out from the position shown in Fig. 1 to the position shown in Fig. 5 against the tension of the spring 65 thereby bringing the pawls 62 into operative engagement with the teeth of the ratchet wheel 59. The ratchet wheel 59 and with it the shaft 58 and eccentric disk 56 will then be rotated by the guide pulley. The eccentric disk 56, shaft 58 and ratchet wheel 59 are normally maintained in the positions shown in Figs. 2 and 3 by a coiled spring 66 which is secured to and between a pin 67 carried by the eccentric disk 56 and a pin 68 mounted on the boss 38.

During normal operation of the hoisting apparatus up and down the cable 15 the guide pulley 10 is rotated at such a rate that the pawls 62 will be maintained out of engagement with the ratchet wheel 59. But in the event that the hoisting mechanism fails and the mechanism starts to drop, the guide pulley 10 will be rotated counter-clockwise at a much faster rate which will centrifugally throw the arms 60 outwardly against the tension of the spring 65 and bring the pawls 62 into operative engagement with the teeth of the ratchet wheel 59. The shaft 58 and eccentric disk 56 being then rotated, the link 53 will be shifted to the left, as viewed in Fig. 3, which will move the latching pin 50 from the position shown in Figs. 1 and 3 to the position shown in Fig. 6, out of engagement with the abutment 44. The spring 41 will then instantly rotate the clamping pulley 34 from the position shown in Fig. 1 to the position shown in Fig. 6 thereby tightly clamping the cable 15 between the clamping block 30 and the clamping pulley 34 and stopping further falling of the apparatus. The locking mechanism is operative to stop falling of the hoisting apparatus to which it is applied before the apparatus has dropped over six inches down the cable.

From the foregoing it will be apparent to those skilled

5

in this art that I have provided a relatively simple and efficient mechanism for accomplishing the objects of the invention.

It is to be understood that I am not limited to the specific construction shown and described herein as various modifications may be made therein within the spirit of the invention and the scope of the appended claims.

I claim:

1. A safety locking mechanism for a hoisting apparatus which is adapted to move up and down a suspended cable, said mechanism comprising a base plate which is adapted to be secured to said apparatus, a pivot stud which is carried by said plate and extends through said plate from the front to the rear thereof, an axial bore extending through said stud, a guide pulley rotatably mounted on said stud in position to contact a downwardly extending cable by which said guide pulley is rotated during the up and down movement of said apparatus, a pressure roller which is operative to maintain said cable in firm contact with said guide pulley, said pressure roller being rotatably mounted on said plate adjacent said guide pulley at one side thereof, a clamping block mounted on said plate below said guide pulley in contact with said cable, a clamping pulley which is operative to firmly grip and clamp said cable against said clamping block, said clamping pulley being eccentrically mounted on said plate adjacent said clamping block, spring means by which said clamping pulley is adapted to be rotated into engagement with said cable, a latching pin by which said clamping pulley is normally held against rotation out of engagement with said cable, said latching pin being carried by a shiftable link, and means by which said link is shifted in a direction to move said latching pin out of latching engagement with said clamping pulley; said means comprising a shaft which is rotatably mounted in the said axial bore in said pivot stud, means by which the rear end of said shaft is eccentrically connected to said link, a ratchet wheel secured to the forward end of said shaft, and a centrifugally actuated pawl rotatably secured to said guide pulley and adapted to engage and rotate said ratchet wheel and said shaft when said guide pulley is rotated in one direction at greater than a predetermined rate and thereby shift said link to move said latching pin out of latching engagement with said clamping pulley.

2. A safety locking mechanism as defined in claim 1 in which said pressure roller is eccentrically mounted on

6

said plate, and in which spring means is provided by which said roller is yieldingly maintained in contact with said cable.

3. A safety locking mechanism for a hoisting apparatus which is adapted to move up and down a suspended cable, said mechanism comprising a base plate which is adapted to be secured to said apparatus, a guide pulley rotatably mounted on said plate in position to contact a downwardly extending cable by which said guide pulley is rotated during the up and down movement of said apparatus, a pressure roller which is operative to maintain said cable in firm contact with said guide pulley, said pressure roller being rotatably mounted on said plate adjacent said guide pulley at one side thereof, a clamping block mounted on said plate below said guide pulley in contact with said cable, a clamping pulley which is operative to firmly grip and clamp said cable against said clamping block, said clamping pulley being eccentrically mounted on said plate adjacent said clamping block, spring means by which said clamping pulley is adapted to be rotated into engagement with said cable, latching means by which said clamping pulley is normally held against rotation out of engagement with said cable, latch releasing means which is operative to move said latching means out of latching engagement with said clamping pulley, a rotatably mounted ratchet wheel, means by which said ratchet wheel is operatively connected to said latch releasing means, and a centrifugally actuated pawl which is rotatably mounted on said guide pulley and is adapted to engage and rotate said ratchet wheel when said guide pulley is rotated in one direction at greater than a predetermined rate to thereby actuate said latch releasing means to move said latching means out of engagement with said clamping pulley.

4. A safety locking mechanism as defined in claim 3 in which said pressure roller is eccentrically mounted on said plate, and in which spring means is provided by which said roller is yieldingly maintained in contact with said cable.

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