G. F. ROYER.

SAFETY MINE HOIST.

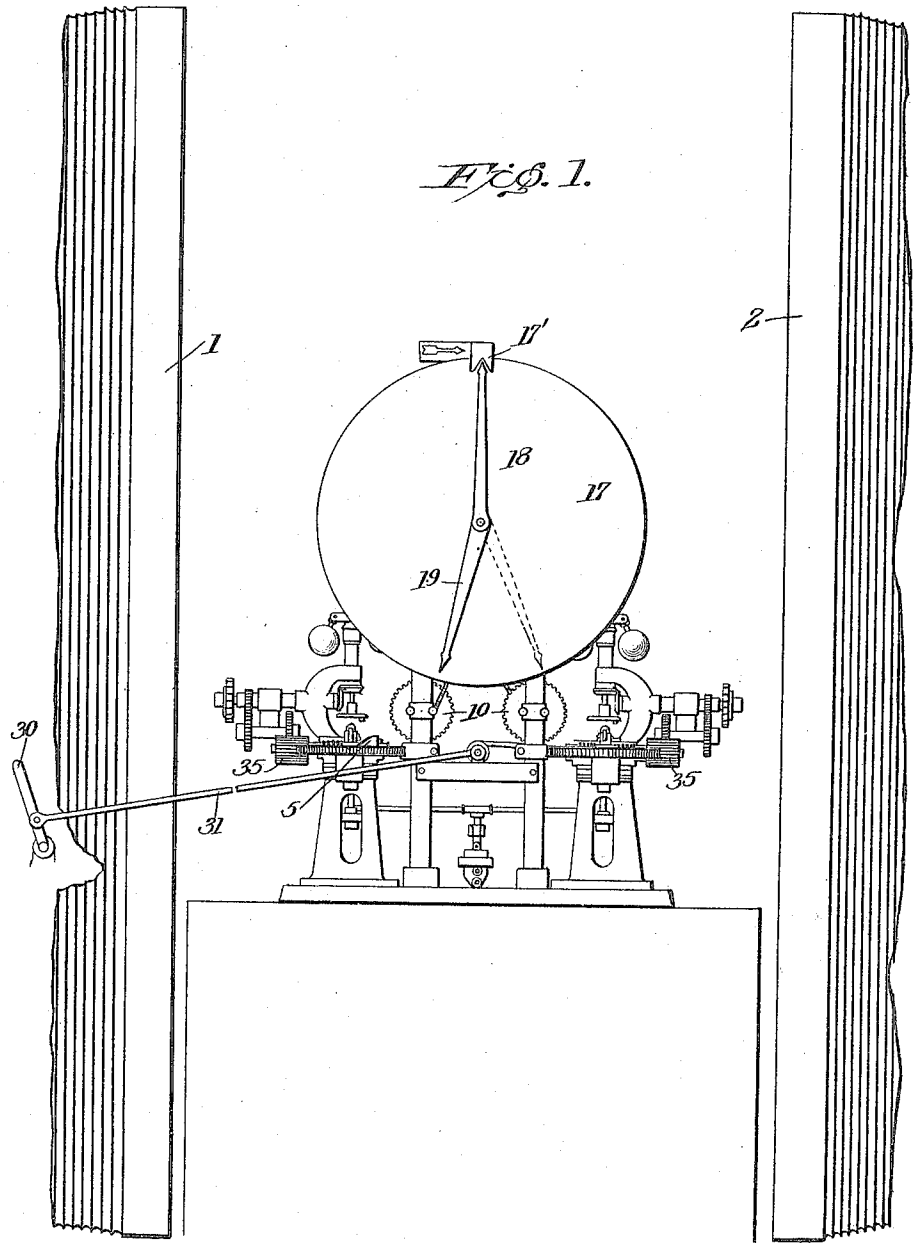
APPLICATION FILED NOV. 10, 1915.

1,213,956.

Patented Jan. 30, 1917.

3 SHEETS—SHEET 1.

FIG. 1.



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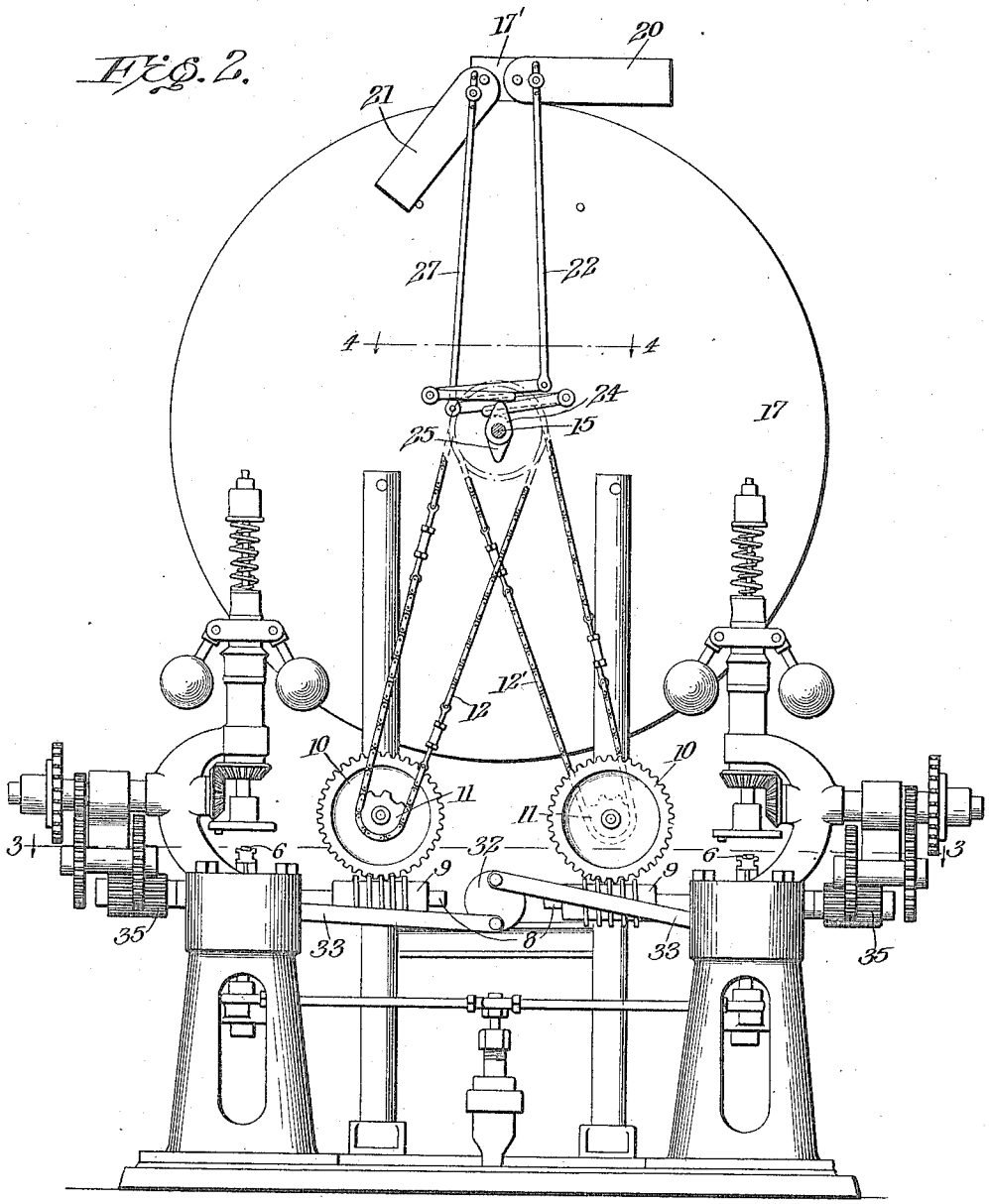
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3 SHEETS—SHEET 2.

FIG. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

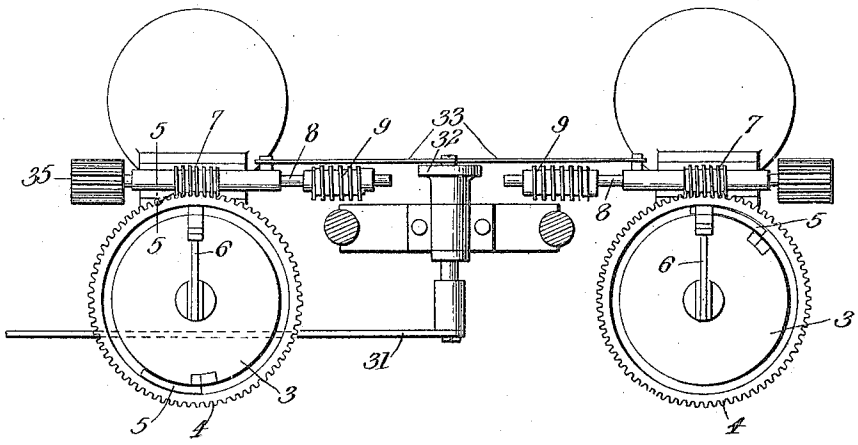


Fig. 4.

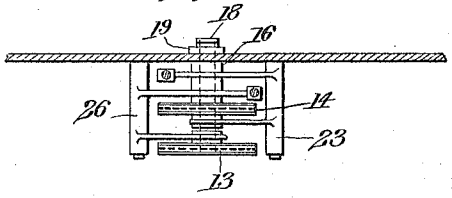


Fig. 5.

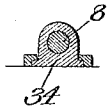
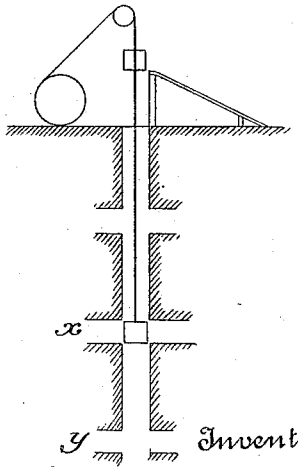


Fig. 6.



Witnesses

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UNITED STATES PATENT OFFICE.

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SAFETY MINE-HOIST.

1,213,956. Specification of Letters Patent. Patented Jan. 30, 1917.

Application filed November 10, 1915. Serial No. 60,731.

To all whom it may concern:

Be it known that I, GEORGE F. ROYER, a citizen of the United States, residing at Wilkes-Barre, Luzerne county, State of Pennsylvania, have invented certain new and useful Improvements in Safety Mine-Hoists, of which the following is a specification.

The present invention relates to improvements in mine hoists and particularly to safety devices or attachments for such mechanism.

The winding drums of mine hoists are operated at very high speeds and great care is required to insure that the ascending car or cage is not carried above the desired dumping level or landing.

To assist the engineer in charge of such an apparatus it is customary to provide a dial and a revolving pointer which travels over the dial in unison with the rotation of the winding drum or drums and the traveling car or cars. With such a construction, however, in which a single hand or pointer is employed in connection with an apparatus including two cars, it is necessary for the engineer to carefully observe the approach of such pointer alternately toward two separated points on the dial. Also with apparatus in which "fast" and "loose" drums are employed, as is frequently the case, the position of the pointer relatively to the dial indicating that a car has reached the predetermined desired limit of its travel is changed whenever the parts are adjusted to work at a different "level" or depth of shaft.

To provide an indicating means for mine hoists in which a traveling hand or pointer will always occupy the same position when either of two cars, simultaneously traveling in opposite directions, has reached the desired limit of its upward travel, regardless of the depth of the shaft or operative level, is one of the objects of the present invention.

It is also customary to provide means by which movement of the winding drums of a mine hoist will be automatically checked in case the mechanism is operated at an excessively high speed or when the car or cars have passed a predetermined level. In many installations the discharge or dumping point of the loads elevated by the hoist is at a considerable elevation above the ground or level where the occupants of the car or cage are expected to leave the same, when it is employed as a means of exit for laborers from the mine shaft. In order that the engineer may be advised that a car or cage is to be occupied by passengers, it is customary and in fact required by the laws of certain States that the operative in charge of loading the cars at the foot of the mine shaft give a predetermined signal and that the same be repeated by the engineer in control of the winding drums. Such signal mechanism commonly includes a lever under the control of the engineer.

A further object of the present invention is to provide means by which the actuation of such lever, required, as before noted, to indicate to the workmen at the foot of the shaft that the engineer understands that the car about to ascend will carry passengers, will effect such an adjustment of the members of the safety device that rotation of the winding drums will be checked when the car has reached the desired landing which is lower than the elevation at which the cars are normally discharged.

In the accompanying drawings, Figure 1 is an elevation of a signal and safety attachment for mine hoists embodying the present invention, and of portions of two winding drums; Fig. 2 is a rear elevation, on an enlarged scale, of the improvements; Fig. 3 is a plan, partly in section, substantially on the line 3—3 of Fig. 2; Fig. 4 is a detail section on the line 4—4 of Fig. 2; Fig. 5 is a section on the line 5—5 of Fig. 3; Fig. 6 is a diagrammatic view.

Referring to the drawings, 1, 2, indicate portions of two winding drums of a mine hoist and in general practice one of these drums, 1, for example, is permanently secured to an engine or power shaft while the other drum, 2, is connected with the same or a similar shaft by a suitable clutch. It will be understood that the drums are so related that while one is operating to wind thereon the cable connected therewith the other is unwinding so that the two cars or cages simultaneously travel at the same speed but in opposite directions. The depth or distance which the lower car will descend in the shaft is varied by disconnecting the drum 2 from its power shaft and permitting the cable thereon to unwind the desired distance or winding the other cable on the drum 1

correspondingly, after which the "loose" drum 2 is again clutched to the driving shaft so that the two drums will operate together.

As is customary in an apparatus of this character, each of the drums referred to is provided with a safety mechanism by which suitable brakes will be set, or the motive power cut off when either drum has completed a predetermined number of revolutions. While any suitable form of such safety mechanism may be employed in carrying out the invention, the embodiment thereof illustrated includes devices like those illustrated and described in detail in my prior Patent No. 1,129,733, dated February 23, 1915. Briefly described, each of said safety devices includes a rotary disk or wheel 3 provided with peripheral worm teeth 4 and having on its upper surface a cam 5 which is adapted to coöperate with a lever 6 controlling the application of a brake device or the means for supplying motive power to the drum. The cam wheel or disk 3 is constantly engaged by a worm 7 on a shaft 8 mounted in suitable bearings and connected by a suitable train of gearing with the adjacent drum so that it will turn with the drum. Each shaft 8 is provided with a second worm 9 which engages a worm wheel 10 mounted on a suitable upright and connected with a sprocket 11. Chains 12, 12′ connect the sprockets 11 with sprockets 13, 14 secured, respectively, on a shaft 15 and a sleeve 16 which surrounds said shaft and extends with it through a stationary dial 17. Two hands or pointers 18, 19 are respectively connected to the shaft 15 and sleeve 16 so that as the sprokets 13, 14 turn said hands will be correspondingly moved over the dial disk 17.

By the connections described it will be seen that the two hands or pointers 18, 19 will be caused to move in unison with the drums 1, 2, respectively, and the parts are so related that when either of said hands occupies the position of the hand 18 in Fig. 1 the drum associated therewith will have completed the number of revolutions necessary to elevate the car supported therefrom to its normal dumping or unloading position. As shown, the dial 17 is provided on its forward face with an upward extension 17′ the lower edge of which is shown as notched and the hand or pointer corresponding to the ascending car or cage of the hoist alines with this notch at the predetermined limit of the upward travel of said car. The relation between the two hands 18, 19 will be varied, of course, as the mechanism is adjusted to operate from different levels in the shaft. For example, if it be assumed that when the parts are in the position shown in Fig. 1 the cars will be lowered in the shaft to the level X in Fig. 6, it will be evident that if the drum 2 is disconnected from its power shaft, so that the car connected thereto can descend to the lower level Y, the hand or pointer 19 will be adjusted relative to the hand or pointer 18, for example, into the position indicated in dotted lines in Fig. 1. In the foregoing description it has been assumed that the hand or pointer 18 is associated with the drum 1 and the hand or pointer 19 with the drum 2 and it will be noticed that the engineer has merely to watch the member 17′ of the dial 17 and the hand or pointer which is approaching thereto, regardless of which of the drums is positively winding the connected cable and which is unwinding it. That is, when either car approaches its dumping or discharge level the hand or pointer associated therewith comes into the position occupied by the pointer 18 in Fig. 1, whereas with indicating mechanisms in which only a single hand or pointer is required the engineer is obliged to observe the travel thereof in both directions and to control the rotation of the drums as it approaches either of the two indications on the dial denoting the proper limits of travel of the cars.

The present invention also provides means for indicating to the engineer the direction in which the winding drums should be started to rotate after the mechanism has come to rest and one of the hands or pointers is in the position occupied by that designated 18 in Fig. 1. This means comprises two arms 20, 21 pivotally mounted on the rear face of the projection 17′ of the indicating dial. The arm 20 is connected by a link 22 with one arm of a rocking sleeve 23, a second arm on said sleeve extending into the path of a cam 24 on the shaft 15. A similar cam 25 is adapted to actuate a sleeve 26 which is connected through a link 27 with the arm 21. As the shaft 15 and sleeve 16 rotate, the cams 24, 25 thereon alternately operate to swing the arms 20, 21 into the position shown in Fig. 1, thereby displaying to the engineer a signal showing the direction in which the winding drums should be started at the next operation.

As above noted and explained in detail in the patent before referred to, the cams 5 will effect a positive stopping of the winding drums when the cars associated therewith have reached the normal discharge level and the engineer has failed, for any reason, to properly stop the machinery. Such discharge level is, as shown in the diagrammatic view, Fig. 6, frequently at a considerable elevation above the ground or the landing where workmen are permitted to enter or leave the cars. It is therefore necessary when the hoist is to be employed as a lift for operatives to insure stopping the cars at a lower level than that at which the contents thereof are normally discharged or

unloaded. In practice and in conformity with the laws of certain States for the protection of mine operatives, it is the duty of a workman at the foot of the shaft to give a definite signal to the engineer that workmen will occupy a car at the next operation of the hoist. The engineer is required to repeat this signal or to indicate at the foot of the shaft that he has received and understood the signal previously given. Various forms of signal devices are, of course, employed and the lever 30, Fig. 1, illustrates conventionally the control device which the engineer is obliged to operate for actuating such signal. As shown, this lever is connected through a rod 31 with a suitable rock shaft on which is mounted a disk 32. At diametrically opposite points said disk 32 is connected to links 33 which are in turn connected with the bearings 34 of the shafts 8. As shown in Fig. 5, said bearings are fitted in guides on their supporting pedestals so that they and the shafts therein are adapted to have a limited longitudinal movement. The effect of moving the shafts 8 by actuation of the lever 30 is therefore to impart a slight movement to the disks 3 independent of any movement of the winding drums and to bring the cams 5 relatively closer to the lever 6 so that the automatically acting safety devices will positively stop rotation of the drums when the ascending car reaches the level where the workmen should leave the same, even if the engineer failed to cut off the motive power.

The connection between the shafts 8 and the gearing driven by the drums, 1, 2, is in the form of an elongated pinion 35, which is of sufficient length to enable the shaft 8 to be moved as described without interfering with the connection between it and its associated drum.

It will be understood that means are provided for holding the lever 30 in either of its adjusted positions. That is when the lever is shifted to indicate that the engineer understands workmen are to be hoisted it will be retained in the position described until the operative in the shaft has signaled that coal is to be hoisted and the engineer in acknowledging this signal restores the lever to its proper position.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. In a mine hoist, the combination with suitable winding drums, cables, and two cages connected with the cables so that they travel simultaneously in opposite directions, of an indicating mechanism including a dial and two hands or pointers adapted to alternately coöperate with a single indication on the dial as the cages, respectively, reach a predetermined elevation, and means adapted to automatically check rotation of the drums on completion of a sufficient number of revolutions to wind a predetermined length of cable thereon.

2. In a mine hoist, the combination with two winding drums arranged to rotate simultaneously, and means adapted to automatically check rotation of the drums on completion of a predetermined number of revolutions thereof, of an indicating mechanism comprising a dial and two hands or pointers connected respectively with said drums whereby they will move relative to the dial in unison with rotation of the drums.

3. In a mine hoist, the combination with a pair of "fast" and "loose" winding drums arranged to rotate simultaneously, and means adapted to automatically check rotation of the drums on completion of a predetermined number of revolutions thereof, of an indicating mechanism comprising a dial and two hands or pointers connected respectively with said drums whereby they will move relative to the dial in unison with rotation of the drums, the relative positions of the hands being varied as the "loose" drum is adjusted to vary the operative length of the cable thereon, for the purpose described.

4. In a mine hoist, the combination with a winding drum, and means adapted to automatically check rotation of the drum on completion of a predetermined number of revolutions thereof, of an indicating mechanism comprising a dial, a pointer connected with the drum and movable over the dial in unison with rotation of the drum, and means coöperating with the pointer for indicating the direction of the next succeeding movement of the drum at the termination of a movement thereof in one direction.

5. In a mine hoist, the combination with two simultaneously acting winding drums, and means adapted to automatically check rotation of the drums on completion of a predetermined number of revolutions thereof, of means including a pointer, movable by the drums, and a dial for indicating a predetermined limit of proper movement of the drums, and supplemental means arranged to coöperate with the pointer to indicate the direction of the next succeeding movement of the drums at the termination of the predetermined movement of the drums.

6. In a mine hoist, the combination with two simultaneously acting winding drums, and means adapted to automatically check rotation of the drums on completion of a predetermined number of revolutions thereof, of means for indicating the desired limits of travel of the drums, and supplemental means for indicating the direction of the next succeeding movement of the drums as they reach the desired limit of movement in either direction.

7. In a mine hoist, the combination with two simultaneously acting winding drums, and means adapted to automatically check rotation of the drums on completion of a predetermined number of revolutions thereof, of means for indicating the desired limits of travel of the drums comprising a dial and two pointers movable thereover and each connected to one of the drums, and supplemental means adapted to coöperate with said pointers alternately for indicating the direction of the next succeeding movement of the drums as they reach the desired limit of movement in either direction.

8. In a mine hoist, the combination with two simultaneously acting winding drums, and means adapted to automatically check rotation of the drums on completion of a predetermined number of revolutions thereof, of an indicating mechanism comprising a dial, two hands or pointers connected respectively to said drums to move relative to the dial in unison with rotation of the drums, two auxiliary signal members normally concealed by the dial, and means for alternately moving said members into position to indicate the direction of the next succeeding movement of the drums as the hands or pointers reach a position corresponding to a predetermined limit of movement of the drums in either direction.

9. In a mine hoist, the combination with two simultaneously acting winding drums, and means adapted to automatically check rotation of the drums on completion of a predetermined number of revolutions thereof, of an indicating mechanism comprising a dial, two hands or pointers connected respectively to said drums to move relative to the dial in unison with rotation of the drums, two auxiliary signal members normally concealed by the dial, and means moving with the hands or pointers for alternately moving said members into position to indicate the direction of the next succeeding movement of the drums as the hands or pointers reach a position corresponding to a predetermined limit of movement of the drums in either direction.

10. In a mine hoist, the combination with two simultaneously acting winding drums, and means adapted to automatically check rotation of the drums on completion of a predetermined number of revolutions thereof, of an indicating mechanism comprising a dial, two hands or pointers connected respectively to said drums to move relative to the dial in unison with rotation of the drums, two auxiliary pivotally mounted signal members normally positioned in rear of the dial, and means turning with the pointers for alternately moving said members into position to indicate the direction of the next succeeding movement of the drums as the hands or pointers reach a position corresponding to a predetermined limit of movement of the drums in either direction.

11. In a mine hoist, the combination of a winding drum, means for normally automatically checking rotation of the drum on completion of a sufficient number of revolutions to wind a predetermined length of cable thereon, a signal control device, and means actuated by said signal control device for rendering the rotation checking means operative before the completion of said normal number of revolutions of the drum, for the purpose described.

12. In a mine hoist, the combination of a winding drum, a cable connected with the drum, a car or cage supported by the cable and adapted to be conveyed thereby to an elevated discharge level, means adapted to automatically check rotation of the drum as the car or cage reaches the discharge level, a signal control device, and means actuated by said device for adjusting the last said means to check rotation of the drum before the car or cage reaches the discharge level.

13. In a mine hoist, the combination of a winding drum, means for automatically checking rotation of the drum, on the completion of a sufficient number of revolutions to wind a predetermined length of cable thereon, including a member rotatable by the drum and a relatively stationary member, a signal control device, and means whereby when said device is actuated the relative positions of said rotatable and relatively stationary members will be varied before the drum has rotated sufficiently to wind the normal predetermined length of cable thereon.

14. In a mine hoist, the combination of a winding drum, a rotary cam geared to the drum, a member controlling rotation of the drum arranged in the path of the cam to be actuated thereby as the drum completes a predetermined number of revolutions, a signal control lever, and means for positively varying the relative positions of said cam drum control member, independent of any movement of the drum, for the purpose described.

15. In a mine hoist, the combination of a winding drum, means controlling movement of the drum comprising a cam connected with the drum to turn therewith at all times and a relatively stationary member extending into the path of the cam, a lever, and connections between the lever and cam whereby when the lever is actuated the cam will be moved relative to said member independent of any movement of the drum.

16. In a mine hoist, the combination of a winding drum, means comprising a worm wheel and a member arranged in the path of a projection on said wheel for limiting rotation of the drum, a shaft having an

elongated pinion engaging a gear driven by the drum and a worm meshing with said worm wheel, and manually actuated means for moving the shaft longitudinally to impart a rotary movement to the worm wheel independent of any movement of the drum, for the purpose described.

17. In a mine hoist, the combination of a winding drum, means comprising a worm wheel and a member arranged in the path of a projection on said wheel for limiting rotation of the drum, a shaft having an elongated pinion engaging a gear driven by the drum and a worm meshing with said worm wheel, and a signal control lever connected with the shaft, whereby when said lever is actuated the shaft will be moved longitudinally to move the worm wheel independent of any movement of the drum, for the purpose described.

18. In a mine hoist, the combination of a winding drum, means comprising a wheel rotatable with the drum and a member arranged in the path of a projection on said wheel for limiting rotation of the drum, a dial, a pointer movable by the drum relative to the dial, and means coöperating with the pointer for indicating the direction of the next succeeding movement of the drum at the termination of a determined movement of the pointer.

In testimony whereof I affix my signature.

GEORGE F. ROYER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."