D. F. LEPLEY.

SAFETY APPARATUS FOR HOISTING ENGINES.

APPLICATION FILED MAY 28, 1909.

949,023.

Patented Feb. 15, 1910.

3 SHEETS—SHEET 1.

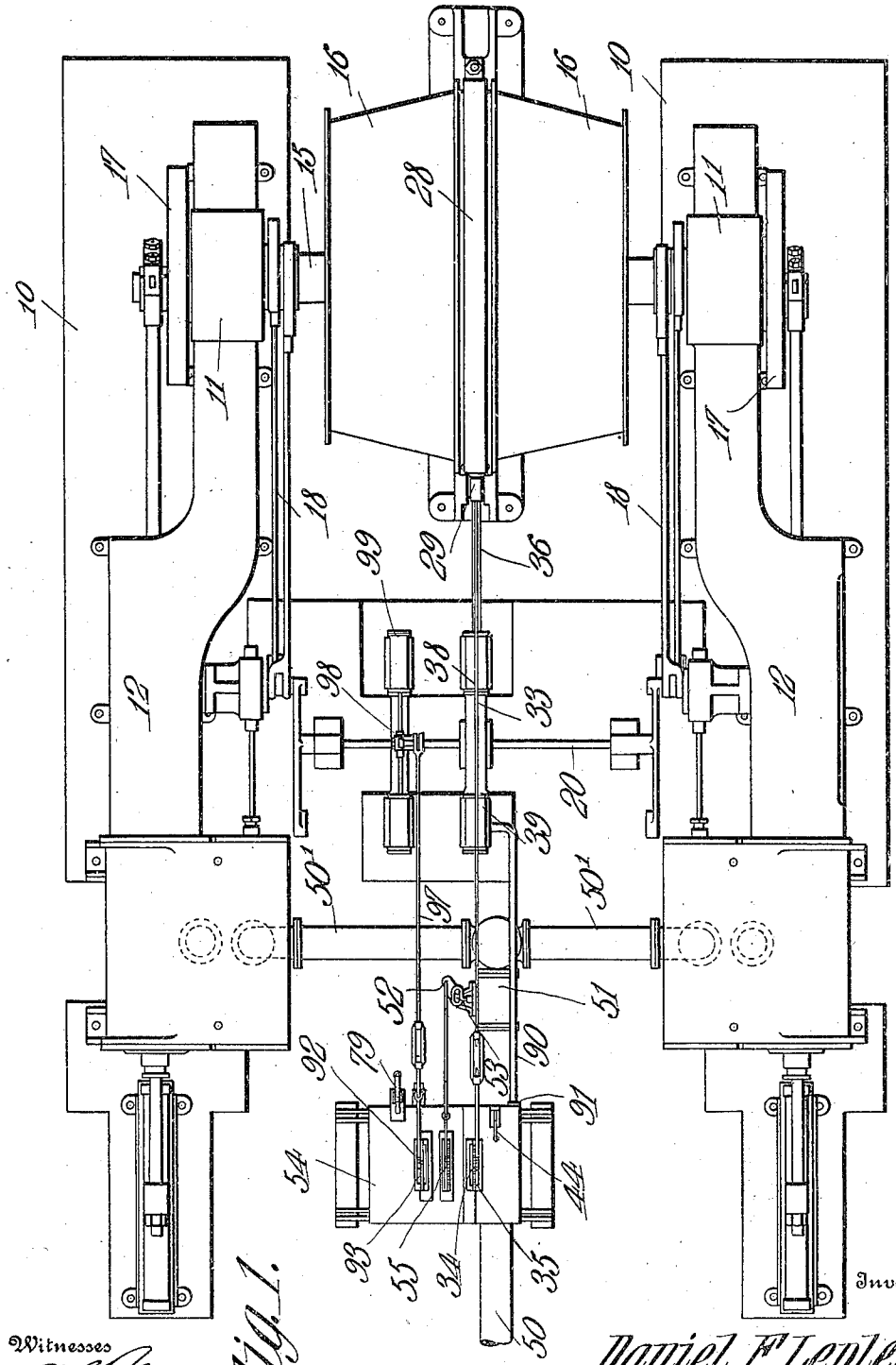


Fig. 1.

Witnesses

E. J. Stewart

F. T. Chapman

Inventor

Daniel F. Lepley,

By C. A. Snow & Co.

Attorneys

D. F. LEPLEY.

SAFETY APPARATUS FOR HOISTING ENGINES.

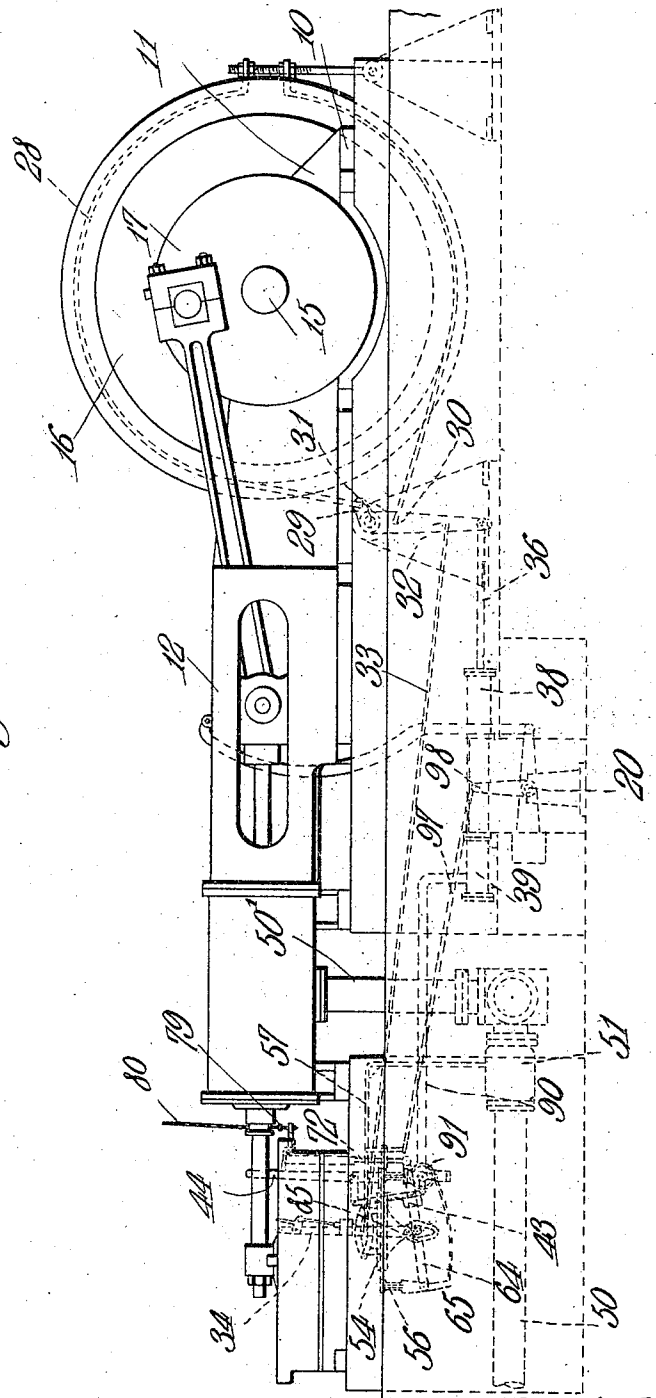
APPLICATION FILED MAY 28, 1909.

949,023.

Patented Feb. 15, 1910.

3 SHEETS—SHEET 2.

Fig. 2.



Witnesses

E. F. Stewart

F. T. Chapman

Inventor

Daniel F. Lepley,

By C. A. Snow & Co.

Attorneys

D. F. LEPLEY.

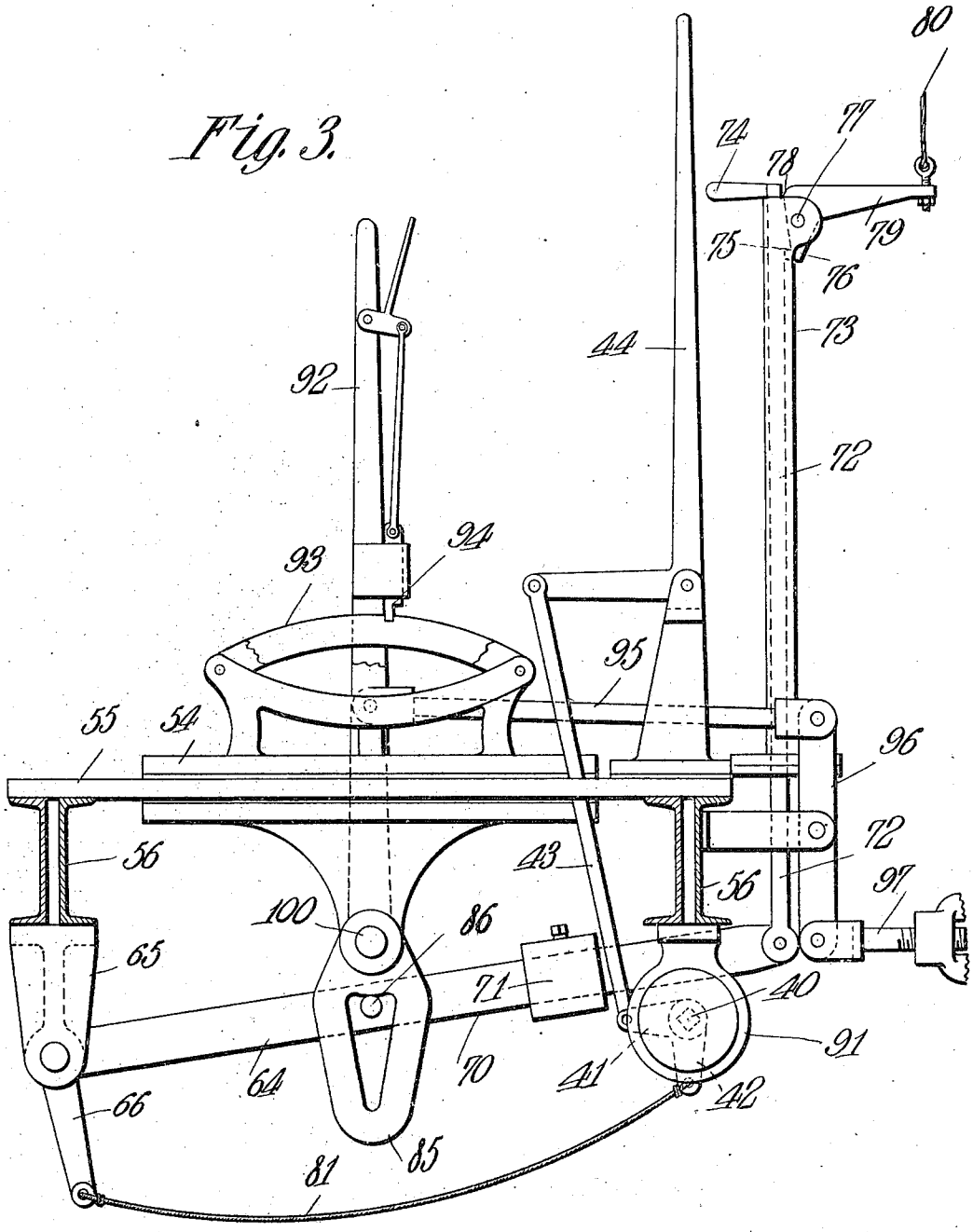
SAFETY APPARATUS FOR HOISTING ENGINES.

APPLICATION FILED MAY 28, 1909.

949,023. Patented Feb. 15, 1910.

3 SHEETS—SHEET 3.

Fig. 3.



Witnesses

E. J. Stewart

F. T. Chapman.

Inventor

Daniel F. Lepley,

By Cushman & Co.

Attorneys

UNITED STATES PATENT OFFICE.

DANIEL F. LEPLEY, OF CONNELLSVILLE, PENNSYLVANIA.

SAFETY APPARATUS FOR HOISTING-ENGINES.

949,023. Specification of Letters Patent. Patented Feb. 15, 1910.

Application filed May 28, 1909. Serial No. 498,869.

To all whom it may concern:

Be it known that I, DANIEL F. LEPLEY, a citizen of the United States, residing at Connellsville, in the county of Fayette and State of Pennsylvania, have invented a new and useful Safety Apparatus for Hoisting-Engines, of which the following is a specification.

This invention relates to safety apparatus for hoisting engines, and is particularly intended for use in connection with hoisting engines used in connection with mine cages or other elevating devices.

In mines where the shafts are of great depth it is necessary to run the hoisting cables at very high speed during the greater portion of the lifting in order to secure the necessary output and the hoisting engines are frequently run at a rate of one hundred revolutions per minute during the early portion of the lift and then reduced in speed to ten or twelve revolutions a minute as the car approaches the top of the shaft, the slowing down being necessary in order that the engine may be placed under control and the cage brought to a gradual stop at the right point without excessive jar or wear on the cage or the hoisting machinery.

Where the engines are not under perfect control when the cage reaches the top of the shaft serious accidents frequently occur through over-winding of the cable and many attempts have been made to avoid these accidents, the cage in some instances being detachably connected to the cable and in other cases the cage has been employed as a means for setting into motion some engine controlling device. Another frequent cause of accident is the over-winding of the cable, after the cage has reached the top of the shaft, through neglect of the engineer to reverse his engine. In such cases the cage instead of being lowered is raised to the hoisting sheaves and serious damage results, inasmuch as a single turn of the engine frequently results in a lift of thirty feet, more or less, of the cage.

The principal object of the present invention is to provide a means for automatically stopping the hoisting engine on the failure of the engineer to do so, when the cage has reached a point at or near the top of the shaft, or where the cage is traveling at so high a rate of speed as it approaches the top of the shaft that it would ordinarily be impossible for the engineer to properly control the engine before the cage reached the hoisting sheaves or when the engineer starts the engine without having first properly set the reverse.

A further object of the invention is to provide an automatic means for applying the brake to the hoisting drum and at the same time cutting off the supply of steam to the engine so as to stop the latter, or by a suitable adjustment of the valves to so throttle the steam as to very materially reduce the speed.

A still further object of the invention is to provide a controlling or governing mechanism of this type of such construction as not to interfere with the ordinary manipulation of the reversing, braking and throttle levers by the engineer.

A still further object of the invention is to provide a controlling device of this type in which it is unnecessary to employ any auxiliary controlling valve, the usual throttle valve being placed under the control of the safety mechanism, thus minimizing the danger of failure through sticking or jamming of an auxiliary valve which under ordinary circumstances would not be used except at long intervals.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel details of construction and arrangement of parts, as will be more fully hereinafter described, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size and minor details of the device may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings:—Figure 1 is a vertical plan view of a hoisting engine provided with safety mechanism constructed and arranged in accordance with the invention. Fig. 2 is a side elevation of the same. Fig. 3 is a detail side elevation showing some of the parts illustrated in Fig. 2, but drawn to an enlarged scale.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The base or sole plate 10 is provided with pillow blocks 11 which generally form a part of the frame of the reciprocating en-

gine 12. The pillow block supported shaft 15 carries a pair of connected winding drums 16 around which pass the usual hoisting cables, one running in one direction and the other in the opposite direction, and these being connected respectively to two mine cages so that when one cage is ascending the other is descending. The shaft 15 is provided with crank disks 17 connected in suitable manner to the pistons of the engines. The engines are provided with suitable valve gears 18 and may be reversed in any ordinary manner, the reversing mechanism being shown in the present instance as connected to a tumbling shaft 20 that is connected in the usual manner to the links.

At the larger central portion of the drums is a brake drum or disk with which engages a band brake 28, the opposite ends of the band being secured to the two arms 29 and 30 of a brake applying lever that is carried by a shaft 31 journaled in a bracket immediately in front of the drum. A lever 32 on the shaft 31 is connected by a rod 33 to a manual brake applying lever 34 that is movable over a notched segment 35 and which may be provided with the usual locking bolt for engagement with said notches. By moving the lever 34 in the proper direction the band brake may be tightened or loosened as desired. The lower end of the brake applying lever 32 also is connected to a piston rod 36 carrying a suitable piston that is arranged within a cylinder 38 and said cylinder is connected to a valve casing 39 containing a valve of any type, which valve when moved in one direction permits steam or other actuating fluid to flow to the cylinder 38 for the purpose of applying the brake and when moved in the other direction permits the escape of the steam and the release of the brake. The valve casing 39 is connected by a pipe 90 to a valve 91 and the stem 40 of this valve is provided with two rocker arms 41 and 42, the arm 41 being connected by a link 43 to a hand lever 44 conveniently located so that the engineer when necessary may use steam for applying the brake instead of using the hand lever. The arm 42 of the valve stem is connected in the manner hereinafter described to the mechanism for automatically opening the valve in case of over-winding of the cable or in the event that the speed of the cage is in excess of the normal as the cage nears the top of the shaft.

The steam main 50 runs horizontally below and between the engines, and is provided with two branches 50′ that lead to the steam chests of the two engines. Near the juncture of the main and branch pipes is arranged a throttle valve 51 which may be of any ordinary construction and which is under the control of a throttle lever 52 that is mounted on a suitable shaft or stud 53. The lever 52 is connected by a rod 57 to a hand lever 55 and by moving the latter in the ordinary manner the engineer may control the quantity of steam passing to the engine or may entirely cut off the steam for the purpose of stopping the engine. The stand for the controlling levers is indicated at 54 being supported on suitable beams 56.

Pivoted to a hanger 65 carried by one of the beams 56 is a bell crank lever 64 having a short arm 66 and a long arm 70, the latter being approximately horizontal and being provided with an adjustable weight 71 that normally tends to swing the arm downward. Of course, in this instance a suitable spring would be the equivalent of the weight 71 and this is to be understood throughout the description. This weighted arm 70 is retained in the normal elevated position by a rod 72 that extends up through a suitable guiding standard 73 carried by the frame and is provided with a lift handle 74 near its upper end. Near the upper portion of the rod is a tooth 75 that is arranged to be engaged by a pawl 76 pivoted on a pin 77 carried by the standard 73. This pawl is provided with a cam portion 78 that extends above the pawl proper and engages with the forward face of the upper end of rod 72 and from the pawl extends an arm 79 that is connected to an operating cable 80. The cable 80 is connected in any suitable manner to any mechanism on or adjacent to the shaft and operable by the car or any attachment thereon so that in case of danger the cable will be pulled and when this cable is pulled the movement is transmitted to the arm 79 whereupon the cam 78 acts to force the upper end of rod 72 to the rear and at the same time the lower end of the pawl tends to ride out from under the tooth 75 and from this double movement of the pawl and the rod the pawl will be positively disengaged and the rod will be allowed to drop, the weight of the rod added to the weighted arm 70 serving to turn the bell crank lever. The shorter arm 66 of the bell crank lever is connected by a flexible cable 81 to the arm 42 of the stem 40 of valve 91 so that if the weighted arm is allowed to fall the valve 91 will be turned in the proper direction for the purpose of admitting steam to the brake applying cylinder thereby stopping or retarding the rotative movement of the winding drums. This flexible connection 81 which may be in the form of a cable, chain, or the like permits the operation of valve 91 by the hand lever without transmitting movement to the bell crank lever 66 and 70 so that the engineer may apply the steam brake by hand without interfering in any manner with the safety mechanism. There is also provided a lever 92 on the stand 54, and this lever is movable about a segment 93, and also may have a latch 94 locking on

the segment at a central point. The lever 92 pivoted on shaft 100 is the reversing lever and is connected by a link 95 to a rock lever 96 which latter is connected by a link 97 to a valve 98 operating the controlling cylinders 99 moving the engine reversing mechanism. The lever 92 is therefore the reversing lever.

The lower portion of the reversing lever is provided with a downwardly extending triangular cam 85 and the lowermost angle of the cam is in the vertical plane of the axis of the shaft 100 when the reversing lever has been moved to the central position. Extending into this open triangular cam is a pin 86 that is carried by the weighted arm 70 and normally this pin is in the same vertical plane with the shaft 100 and there is a considerable space between the periphery of the pin and the upper more widely separated wall of the cam, so that the reversing lever may be readily operated by hand without coming into contact with the pin thereby allowing the engineer the utmost freedom in control.

If the reversing lever be moved to any position except the upright or neutral position it necessarily follows that the lowermost angle of the cam must be moved out of the common vertical plane of shaft 100 and pin 86 and when in any other than the neutral position the descent of the weighted arm 70 will cause the pin 86 to ride down the angular face of the cam then immediately beneath the end, thus shifting the lever back to the neutral position. The throttle lever may have a similar cam control actuated by the arm 70. It will thus be seen that should the cable be operated from any cause while the engine is running the lever 70 will fall and in falling will bring the reversing lever to the neutral position and at the same time will open the valve 91 for the purpose of admitting steam to the brake applying cylinder so that the brake will be applied while at the same time the supply of steam is cut off and the engine will be brought to a stop. Under some circumstances it is evident that the device may be employed only as a controlling and not as a stopping means and may operate for the purpose of moving the valve so as to only partially close the same and to apply the brakes lightly and in this way bring the engine under control rather than to a complete stop. The rock lever 96 is used simply to determine the direction of movement of the lever 92 and may of course be omitted, when the link 97 will connect directly with said lever 92.

It is to be noted that the device is to be active only in that zone of travel of the cage in which, under ordinary circumstances, the engineer should have the engine under control and running slowly, and when in full operation the device should be quick acting so that should the cage enter such zone under high speed the maximum stilling effort is exerted automatically and the cage is stopped before it reaches the sheaves.

In the structure shown the quick action of the device is due to the fact that the actuating mechanism is constantly urged toward the active position by a stored force, though normally held inactive by a constraining means, and when released the full power of the stored force is exerted instantly to cause a rapid movement of the parts, to the full active position thus stopping the hoisting mechanism at once, the device being an emergency device acting with the degree of rapidity demanded by emergency conditions, but entirely still under normal conditions.

What is claimed is:—

1. In an apparatus of the class described, winding drums, actuating means for the drums, a controlling lever for said actuating means having active positions on each side of a neutral position, a gravity member in operative relation to said lever, means for holding said gravity member normally inactive to said lever, and means for releasing the gravity member to move under the action of gravity actively to said lever to cause the return of the latter from either of its active positions to a neutral position.

2. In an apparatus of the class described, winding drums, actuating means for the drums, a brake for the drums, a reversing mechanism for the actuating means for the drums and quick acting automatic means for moving the reversing mechanism of the drum actuating means to the central or neutral position and for also applying the brake at a predetermined period in the operation of the apparatus.

3. In an apparatus of the class described, winding drums, actuating means for the drums, a controlling lever for said actuating means having a cam extension on one side of its pivot, a gravity member in operative relation to said cam extension, means for holding the gravity member normally inactive to the said cam extension, and means for releasing said gravity member to the action of gravity to act on the cam to return the lever to a neutral position.

4. In an apparatus of the class described, winding drums, actuating means for the drums, a controlling lever for said actuating means formed with an open triangular cam on one side of its pivot, a gravity member in operative relation to said lever with a pin projecting therefrom and entering the said open triangular cam, and means for holding said gravity member normally inactive to the lever and for releasing the said gravity member to act on the lever through the engagement of its pin with the cam to return the lever to a neutral position.

5. In an apparatus of the class described, winding drums, actuating means for the drums, a reversing mechanism for the drum actuating means and quick acting automatic means for moving the reversing means for the drum actuating means to a neutral position on the failure of the operator to perform his normal duties.

6. In an aparatus of the class described, winding drums, actuating means for the drums, a controlling lever for said actuating means provided with an open triangular cam extension, a bell crank lever entering the cam extension of the controlling lever, a weight on said lever, means for holding the lever normally against the action of the weight and for releasing the lever to the action of the weight, a brake member for the drums, actuating means for said brake member, controlling means for the said actuating means, a lever for operating said last named controlling means, and connections between the weighted bell crank lever and the controlling means for the brake actuating means.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

DANIEL F. LEPLEY.

Witnesses:

WILLIAM H. SOISSON,

GUSTAV E. T. WAGNER.