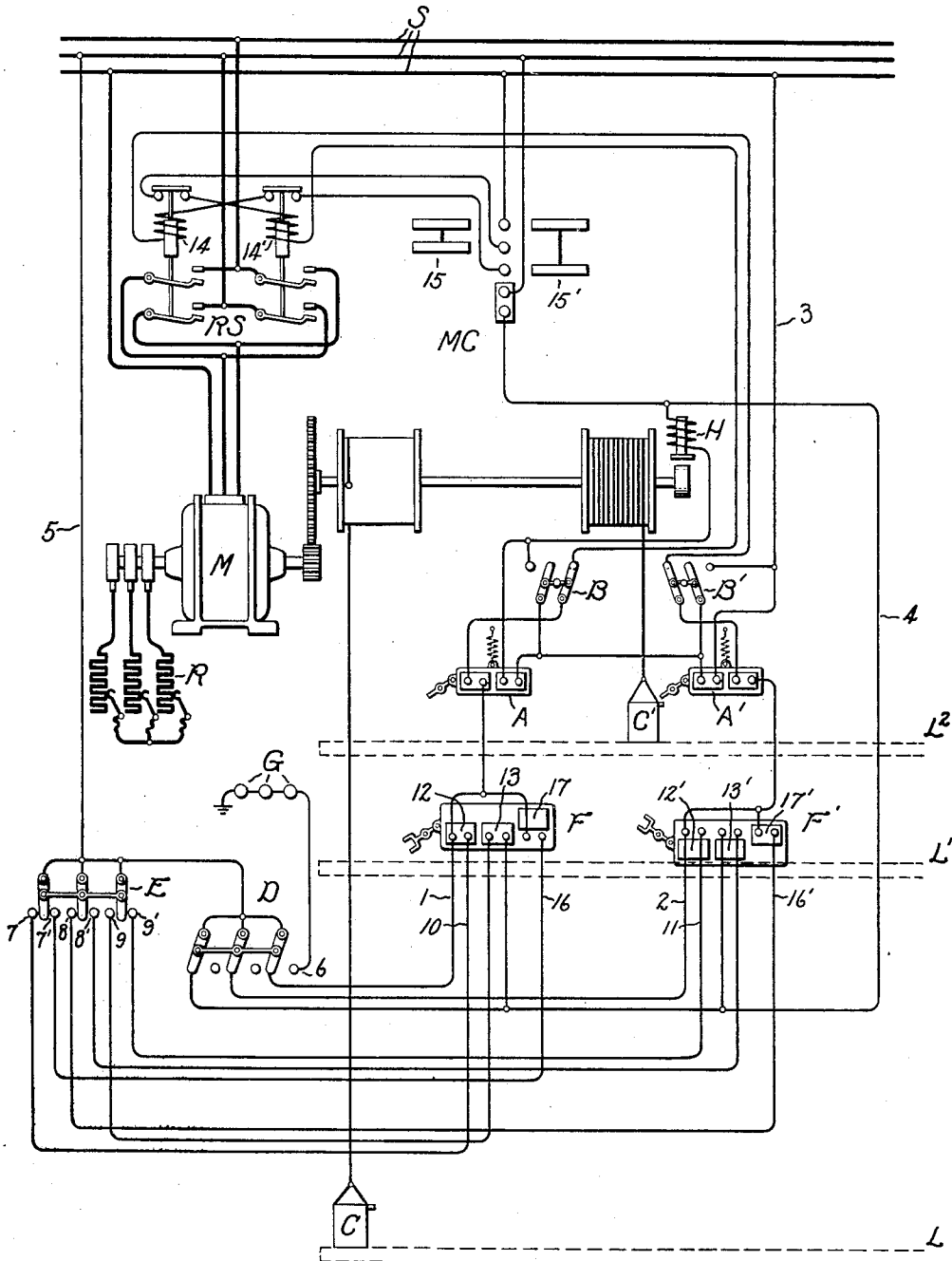


1,273,661.



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UNITED STATES PATENT OFFICE.

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INTERLOCKING CONTROL FOR MINE-HOISTS.

1,273,661.

Specification of Letters Patent.

Patented July 23, 1918.

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To all whom it may concern:

Be it known that I, CHARLES L. PERRY, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Interlocking Controls for Mine-Hoists, of which the following is a specification.

My invention relates to the control of motor driven hoists and has for its object the provision of improved means whereby the hoist may be started, stopped and generally controlled in a reliable, simple and efficient manner.

My invention relates more specifically to the control of mine hoists in which there is a landing platform for men at a lower elevation than the point at which the coal or other material is dumped. Serious accidents have been caused by carrying men beyond their landing platform and into the "dump," and various methods have been suggested for providing protection against such accidents which, however, have not completely insured the stopping of the hoist at the men's platform in case of carelessness of the operator. One of the objects of my invention is to provide improved means for insuring the stopping of the hoist at the men's platform and eliminate such accidents.

In carrying out my invention, I provide means whereby when men are to be carried up in the cage, a signal is given by an operator at the bottom of the shaft to the hoist operator who is generally stationed near the men's landing. In giving this signal, he also makes certain connections which make it impossible for the operator to start the hoist until he performs some act, such as the throwing of a switch, which will render the limit switch at the men's landing effective to stop the hoist in case the operator fails to do so. Other objects and purposes of my invention will appear in the course of the following specification in which I have described my invention as embodied in concrete form for purposes of illustration.

The invention will best be understood by reference to the accompanying drawing in which it is diagrammatically illustrated as applied to a balanced hoist having two cages C and C' arranged to move in opposite directions between a lower or loading level L and an unloading platform or "dump" L².

Located some distance below the "dump" is the men's landing platform L' at which it is necessary to insure the stopping of an upward bound cage carrying men.

The cages are suspended from drums 60 mounted on a shaft driven by the electric motor M, here shown as a three phase induction motor receiving current from a three phase supply line S, through electromagnetically operated reversing switches 65 RS adapted to deliver current to the motor for either direction of rotation for hoisting or lowering the cages. The actuating of the reversing switches RS is controlled by a master controller MC, the contacts of which are arranged to close the circuit of the actuating coil of either of the reversing switches to cause the motor to be connected to the supply line for the desired direction of rotation. The speed of the motor may be 75 controlled through the variable resistance R.

Located above the "dump" are the usual limit switches A—A' for preventing overwinding of the drums and associated with these limit switches are the usual "backing out" switches B—B', which in case either of said overwind limit switches are tripped by a cage, through neglect on the part of the hoist operator to stop the motor, may be manipulated to release the emergency 85 brake and make possible the starting of the motor in the reverse direction for "backing out."

All of the features so far described are commonly embodied in such hoist equipments and form no part of my invention.

The novel features of my invention, designed to insure the stopping of the cages at the men's platform L', comprise the triple pole switch D located at the loading 95 level L; the triple pole switch E located at the hoist operator's station, with the master controller MC, usually in the vicinity of the men's platform L'; the limit switches F—F' adapted to be tripped by projections on the 100 cages, as they reach the men's platform; signaling means such as lamps G located at the hoist operator's station and included in a circuit adapted to be closed by the switch D at the loading level; and an emergency 105 brake H associated with the drum shaft, said brake being normally maintained released by its magnetizing coil, but adapted to be applied in emergency by the opening of the circuit of its coil by the tripping of the 110

various limit switches under certain conditions.

During normal hoisting operation, when men are not being carried, the elements and connection are maintained as shown in the drawing, the motor being started and stopped by the hoist operator by means of the master controller MC. Under these conditions the tripping of the limit switches F—F' as the cages approach the men's platform L', does not affect the motor control circuits, which are by-passed about these limit switches through the leads 1 and 2 respectively, and through the switch D.

As stated above the emergency brake H is normally released, as its operating coil is maintained energized, a separate service brake not shown in the drawing, being generally used. With the various switches in the positions illustrated, the brake coil is energized by a circuit across the supply line, including the lead 3, limit switches A—A', the brake coil, lead 4, switch D and lead 5.

When switch D is open, the brake coil is energized by a circuit through contacts closed in the "off" position of the master controller MC, the brake coil, the limit switches A—A' and lead 3. In the course of this normal operation of the hoist, the hoist control operator is notified by an operator at the loading level, by any suitable signaling means, not illustrated in the drawing, when the cages are loaded and ready to be hoisted.

When, however, men are to be hoisted, the operator at the loading level signals the hoist control operator to that effect and that the cage containing the men is ready to be hoisted, by closing switch D on contact 6, thus completing a circuit through the signal lamps G. One of the lamps in this signal circuit may be located at the loading level adjacent the switch D, to indicate to the operator at this point that the signal circuit is properly closed.

The closing of the switch D on the signal contact 6 opens the by-pass circuits 1 and 2 around the limit switches F—F' and makes it impossible for the hoist control operator to start the motor by operating the master controller MC, until he has first closed switch E on the contacts 7, 8, 9 or contacts 7', 8', 9', and thus made possible the closing of the motor control circuits through leads 10 or 11 and contacts 12 or 12' of the respective limit switches F, F'. The closing of switch D on the signal contact 6, and the closing of switch E on contact 9 or on contact 8', transfers the emergency brake coil to a circuit from lead 4 either through contact 13 of limit switch F, or through contact 13' of limit switch F', depending upon the positions of the respective cages. Assume that switch D has been closed on contact 6 to signal the control operator that

cage C is ready to hoist men and that the control operator, after closing switch E on contacts 7, 8, 9, turns master controller MC to the right to close an energizing circuit for the operating coil 14' of the reversing switch RS, through the contact segments 15; the motor now starts hoisting cage C and lowering cage C'.

As cage C' passes the men's platform L' it engages the lever of limit switch F', throwing it to the position corresponding to that in which limit switch F is shown, and as cage C reaches the men's platform L' it trips limit switch F and opens the motor control circuit at contact 12, thus deenergizing the operating coil 14' of the reversing switch RS to open the motor circuit, and also opens the brake coil circuit at contact 13 causing an application of the emergency brake, insuring the stopping of the motor if the control operator, through carelessness has neglected to throw the master controller to the "off" position and apply the service brake. At this time the cage C having reached and been stopped at the men's platform L', the cage C' is still some distance above the loading level L; in order to start the motor to lower cage C' to the loading level and simultaneously hoist cage C to the "dump" L², it is necessary for the control operator to throw switch E over to contacts 7', 8', 9', to close the motor control circuit through lead 16 and contacts 17 of limit switch F which are now closed.

The contacts of the limit switches F and F' should preferably be so proportioned and arranged that, when the respective cage C or C' is stopped by the hoist operator at the men's platform, they simultaneously make contact with all fingers to prevent an unnecessary application of the emergency brake when the cage is raised to the "dump".

When cage C' is at the loading level and ready to be hoisted, the switches D and E and the master controller MC must be correspondingly operated.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus arranged and connected in what I now consider to represent the best embodiment thereof; but I desire to have it understood that the arrangement shown is only illustrative and that the invention can be carried out by other means and therefore I aim in the appended claims to cover all modifications which are within the scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:—

1. The combination with a motor driven hoist having a loading platform and two unloading platforms, one at a higher elevation than the other, of a limit switch at the

lower unloading platform and means controlled jointly from the loading platform and from the vicinity of the lower unloading platform for rendering the limit switch effective to stop the motor.

2. The combination with a motor driven hoist having a loading platform and two unloading platforms, one at a higher elevation than the other, of a switch at the loading platform, a switch remote from the loading platform and controlled by the operator, a limit switch at the lower unloading platform and connections including said two switches for rendering the limit switch effective to stop the motor.

3. The combination with a motor driven hoist having a loading platform and two unloading platforms, one at a higher elevation than the other, of a switch remote from the loading platform and controlled by the operator, a switch at the loading platform for signaling to the operator, a limit switch at the lower unloading platform and connections including said two switches for rendering the limit switch effective to stop the motor.

4. The combination with a motor driven hoist having a loading platform and two unloading platforms, one at a higher elevation than the other, of a switch at the loading platform, a switch remote from the loading platform and controlled by the operator, a limit switch at the lower unloading platform which may or may not stop the motor depending upon the condition of said switches, and means whereby when the switch at the loading platform is moved to its effective position with reference to the limit switch the motor can only be started after the operator's switch has been moved to correspond with the switch at the loading platform and render the limit switch operative to stop the motor.

5. The combination with a motor driven hoist having a loading platform and two unloading platforms, one at a higher elevation than the other, of a limit switch at the lower unloading platform, a switch remote from the loading platform and controlled by the operator for governing the effectiveness of the limit switch to stop the motor, a switch at the loading platform for signal-

ing the operator and also governing the limit switch, and means whereby when the switch at the loading platform is moved to signal the operator and render the limit switch effective, the motor can only be started after the operator's switch has been moved to correspond to the switch at the loading platform and render the limit switch operative to stop the motor.

6. The combination with a motor driven hoist having a loading platform and two unloading platforms, one at a higher elevation than the other, of a switch at the loading platform, a switch remote from the loading platform and controlled by the operator, a limit switch at the lower unloading platform and controlled conjointly by said two switches to render it effective to stop the motor and connections whereby after the motor has been stopped by the limit switch it cannot be again started to carry the hoist to the upper unloading platform until said operator's switch is again operated.

7. The combination with a motor driven balanced hoist having a loading platform and two unloading platforms, one at a higher elevation than the other, of two limit switches at the lower unloading platform one operated by each cage in its hoisting movement and means controlled jointly from the loading platform and from the vicinity of the lower unloading platform for rendering either limit switch effective to stop the motor depending upon which cage is being hoisted.

8. The combination with a motor driven balanced hoist having a loading platform and two unloading platforms, one at a higher elevation than the other, of a switch at the loading platform, a switch remote from the loading platform controlled by the operator, two limit switches at the lower unloading platform one controlled by each cage in its hoisting movement and connections including said two switches for rendering either limit switch effective to stop the motor depending upon which cage is being hoisted.

In witness whereof, I have hereunto set my hand this 22nd day of March, 1918.

CHARLES L. PERRY.