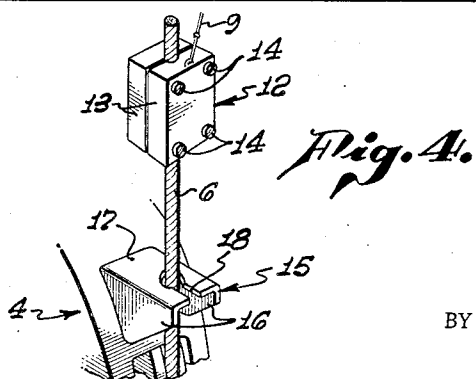
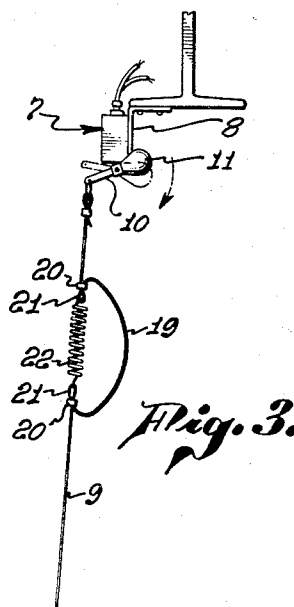
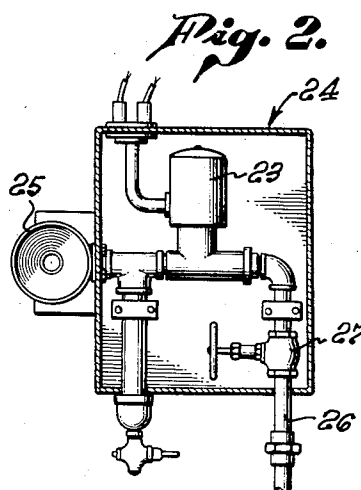
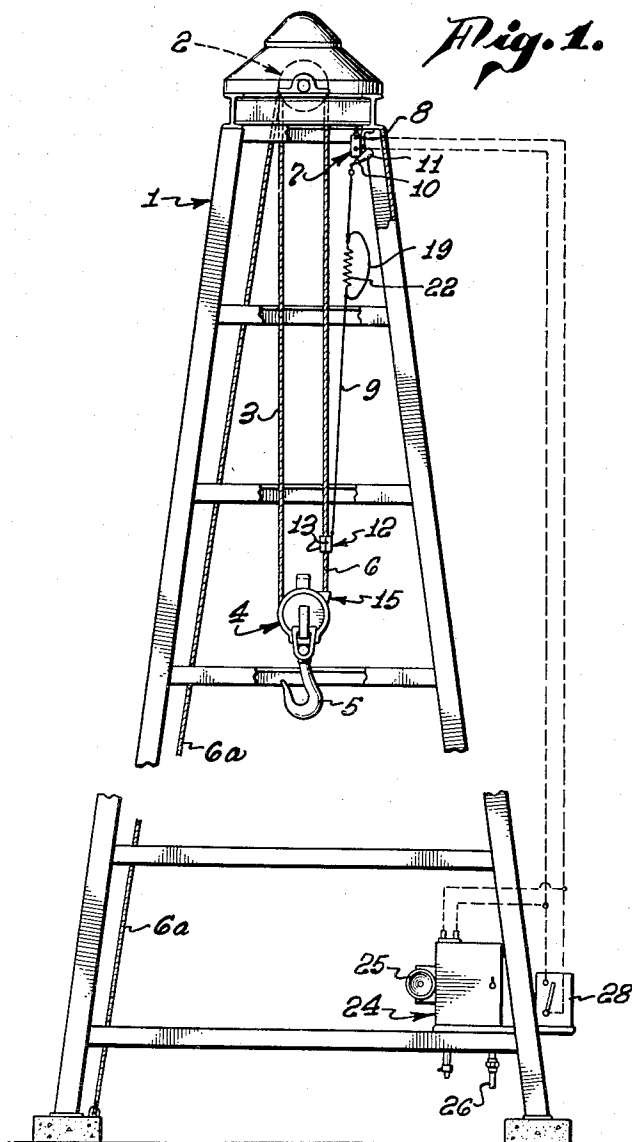


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CROWN BLOCK SAFETY SWITCH

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CROWN BLOCK SAFETY SWITCH

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This invention relates to a safety device for use in connection with well-drilling apparatus wherein warning is given of movement of the traveling block into a danger zone which is in proximity to the crown block mounted at the top of the well-drilling derrick.

In apparatus for drilling wells, particularly in a rotary drilling apparatus, a well derrick is constructed which supports at its top a crown block comprising a plurality of variously arranged pulleys or sheaves. Associated with the crown block is a traveling block which contains an arrangement of pulleys which are interconnected with the pulleys of the crown block by means of a cable for permitting movement of the traveling block generally within the derrick structure. Various types of well-drilling equipment are supported from the traveling block and often the traveling block must be moved into close proximity with the crown block in order to effectively and efficiently install certain types of well-drilling equipment. When installing such equipment, the traveling block may be accidentally pulled into the crown block causing damage to the blocks, the well-drilling equipment and possibly resulting in personal injury to the members of the drilling crew.

Prior proposed safety devices for warning the drilling crew when the traveling block approached the crown block were expensive and not positive in their action. One prior safety device utilized a photoelectric cell mounted on the well derrick so that its beam intercepted the path of travel of the traveling block and upon interception a warning signal was automatically given. Other safety devices included levers and strings which when contacted by the ascending traveling block caused actuation of a sound warning means, lights or other signalling devices. All of the prior safety devices have not been completely reliable and have not met with success because in their arrangement a certain amount of interference with the well-drilling operation was created by the manner in which they were installed within the crowded derrick structure. Furthermore, these prior devices required constant maintenance and were not entirely fool-proof. Some of them did not permit elevation into close proximity of the crown block which is sometimes necessary in the drilling operation.

It is therefore a primary object of this invention to provide a simple, effective, fool-proof safety device for use in a well-drilling derrick structure for providing an effective warning when the traveling block moves past a predetermined point

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indicating its entry into a danger zone adjacent the crown block.

Another object of this invention is to provide a safety device as stated above wherein positive operation of the device is provided.

Another object of this invention is to provide a safety device as above described which will require a minimum of maintenance and which is substantially fool-proof.

A further object of this invention is to provide a safety device of the character described above wherein the traveling block may be permitted to ascend into the danger zone in proximity to the crown block after the warning has been given and when it is necessary because of the particular drilling operation.

Generally speaking, this invention contemplates a safety device wherein as the traveling block ascends past a predetermined point it will engage and lift weight means operatively connected to a control switch mounted adjacent the top of the derrick structure. Energization of the switch actuates a valve which controls fluid pressure means for operating a sound-producing warning device.

It will be seen that an important object of the invention is the provision of means actuated by the traveling block for energizing a warning system, the means being inexpensive to install, and not interfering with the stacking of drill pipe, pulling of tools and other operations.

Still another object of this invention is to provide a safety device as above described, wherein means are provided for preventing actuation of the control switch during normal movement of the traveling block within the derrick structure.

Other objects and advantages of this invention will be readily apparent to those skilled in the art from the following description of the drawings.

In the drawings:

Fig. 1 is a fragmentary elevational view of a well-drilling derrick embodying an installation of this safety device.

Fig. 2 is a sectional view through a box carrying the sound producing warning means used in this invention.

Fig. 3 is a fragmentary, enlarged view taken adjacent the top of the derrick.

Fig. 4 is an enlarged fragmentary view of the traveling block and slidable weight used in this invention.

Referring particularly to Fig. 1 a well derrick structure is indicated generally by 1. At the top of the derrick structure is mounted crown block means 2 comprising a plurality of sets of

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pulleys or sheaves generally aligned over the well hole. Suspended from the crown block means and connected therewith by a plurality of lays of cable 3 is a movable or traveling block means 4. The traveling block means 4 may carry a hook 5 for attachment of various well-drilling tools and devices. It will be readily understood that the traveling block is movable vertically in order to hoist and align well-drilling equipment such as the drilling stem and to withdraw and install long interconnected lengths of drill pipe wherein the traveling block must be elevated into proximity with the crown block means. The reaving of the crown block and traveling block includes a stationary deadline 6 extending between the traveling block and the crown block, the deadline passing over the crown block and then extending downwardly as indicated by portion 6a for anchoring by any suitable means to the derrick sub-structure.

At the top of the derrick structure and in a corner thereof adjacent the deadline 6 is installed a control or limit switch 7 in any suitable manner as by mounting on a bracket 8 secured to the well derrick structure. The control switch 7 is placed in the extreme corner of the derrick structure for the purpose of permitting maximum angularity between a weight suspension line 9 and the deadline 6, without traversing the rigging lines of the block.

The suspension line 9 may be made of any suitable wire cable and is connected at its upper end to an end of arm 10 pivotally mounted intermediate its ends and having a weighted portion 11 at its opposite end. At the lower end of line 9 is connected a weight means or block 12 which is adapted to slide along the deadline 6 and is positioned at a predetermined point indicating the lower extremity of a danger zone in proximity to the crown block. The block 12 may include two separate members 13 which are provided with longitudinally extending aligned grooves for encompassing the deadline 6 when the members 13 are placed therearound and secured by screws 14. The grooves in the blocks 13 are of sufficient radii to permit the block to freely slide on the deadline 6.

A pickup bracket 15 is mounted in any convenient manner as by welding on the traveling block 4 and includes spaced depending flanges 16 joined by a top wall 17 having a key-shaped slot 18 formed therein. The inner circular portion of the slot 18 permits passage therethrough of the deadline 6 and the top wall 17 projects outwardly from the traveling block 4 a sufficient distance so that when the traveling block 4 is elevated to the point where the weight means 12 is suspended it will engage and lift the weight means 12, preventing said weight from fouling the sheaves of the traveling block.

The suspension line 9 is provided with a loop 19 adjacent the switch 7. The loop 19 may be formed by securing cable clamps 20 at spaced points in line 9 in a manner to form eyes 21. The eyes 21 afford connection for a tension coil spring 22 extending therebetween of shorter length than the length of the suspension line included between the cable clamps 20. It will be readily understood that the coil spring 22 and loop 19 will permit swinging and movement of the traveling block out of a vertical position without causing movement of the arm 10 about its pivot point. Movement of the traveling block is thereby permitted within the derrick structure without causing actuation of the control switch when the

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traveling block is not in the danger zone adjacent the crown block.

The free gravitational suspension of the weight means 12 around the deadline 6 by the line 9 maintains the control switch in closed position during normal operation of the traveling block below the weight means 12. When the traveling block is moved into the danger zone in proximity to the crown block, the bracket 15 on the traveling block picks up and lifts the weight means 12 as it ascends into the danger zone. As the gravitational pull of the weight means 12 on the arm 10 is overcome by lifting of the weight means, the counter-weight 11 causes the arm 10 to move about its pivot point causing the contacts in the control switch 7 to separate for opening the electrical circuit therein. The control switch is electrically connected to a solenoid valve 23 mounted in a box 24 adjacent the bottom of the derrick. Upon opening of the circuit in the control switch 7, the solenoid valve is caused to be actuated and opens to permit passage of the fluid means such as air for actuation of sound producing warning means 25 such as a horn, siren or other means, mounted externally on the box. The fluid means supply is connected to the solenoid valve by line 26 having a globe valve 27 therein for manually shutting off or opening the supply of fluid means.

When the traveling block moves into the danger zone and the warning is given, the drilling operator may cause the traveling block to descend out of the danger zone, or if he finds it necessary to further elevate the traveling block he may shut off the sound warning device by means of a by-pass switch 28 mounted on the derrick adjacent to the box 24. The by-pass switch 28 is electrically connected to the circuit between the switch 7 and the solenoid valve 23 as indicated by diagrammatic lines wherein closure of the by-pass switch will supply electrical current to the solenoid valve causing it to close and shut off the supply of fluid means to the sound warning means.

It will be readily apparent to those skilled in the art that the above arrangement of a control switch mounted adjacent the top of a derrick and actuated by upward movement of the traveling block means may be modified and arranged so that the hoisting apparatus may be automatically stopped when the traveling block moves into the danger zone instead of producing a warning sound as described above.

If desired, automatic and auxiliary controls supplementing the warning device may be operatively connected to the device and to the hoist or draw works, draw works driving means and the prime mover for preventing the traveling block from running into the crown block by automatically stopping the traveling block while at the same time giving a warning that the traveling block is in the danger zone.

It will be readily apparent that the above-described arrangement of a safety device provides an automatic, positive, fool-proof warning when a traveling block moves into proximity with the crown block. Since the control switch is normally in closed position, opening of the circuit by lifting of the weight means will positively cause the solenoid valve to open for actuation of the sound producing means. It should also be noted that in the event of an unexpected failure of electric current, the solenoid valve will be actuated by the pressure fluid so that a warning will be given by the sound producing means.

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Thus the electrical energy used to operate the warning device actually prevents the sound producing device from giving a warning because the electrical energy causes the solenoid valve to close. This valve is opened either by opening of the limit switch contacts or by failure of the electrical current supplied thereto. If the current fails, the crew is warned of such failure by the sounding of the warning device.

Mounting of the suspension line 9, control switch 7 and the weight means 12 adjacent the top of the derrick provides an arrangement where there is a minimum of interference with well-drilling operations performed beneath the top of the derrick.

It will be readily understood by those skilled in the art that the above example may be modified and changed without departing from the spirit of this invention. The control switch may be normally open and upon closure by the weight 11 may energize a circuit leading to an electrically operated siren or an electrically operated valve which supplies pressure fluid to a horn, whistle or siren.

Instead of a separate electrical control switch and a secondary signal actuating switch or valve such as 23, the weight 12 may be directly connected by line 9 and its tension loop to a counter-balanced quick-acting valve in a pressure fluid line running to the whistle, horn or siren, whereby lifting of weight 12 permits such valve to open and sound the alarm. In such case, instead of gravity being the force which actually moves the valve (or switch) the force of the pressure fluid would move the valve into signal actuating position.

All changes and modifications coming within the scope of the appended claims are embraced thereby.

I claim:

1. In a well drilling apparatus including a derrick provided with a crown block and a traveling block operably associated therewith, a safety signal operating device comprising: a two-position signal control member provided with force means for moving the control member into one position; a weight slidably mounted on a deadline connecting the crown block and traveling block; a cable means connecting the weight and said signal control member, said cable means including a tension spring connecting spaced apart intermediate points of said cable means, said weight and cable means normally overcoming the force means to hold the control means in another position; and means associated with the traveling block for lifting the weight and allowing the control member to be moved into said first-named position by the said force means.

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2. In a well drilling apparatus including a derrick provided with a crown block and a traveling block operably associated therewith, a safety signal operating device comprising: a two-position signal control member provided with force means for moving the control member into one position; a weight slidably along a deadline connecting the crown block and traveling block; a cable connecting the weight and the signal control member including a resilient means, said resilient means comprising a tension spring having opposite ends connected to intermediate points on said cable spaced apart to place said spring under tension, said weight and cable normally overcoming the force means to hold the control means in another position; and means associated with the traveling block for lifting the weight and allowing the control member to be moved into said first-named position by the said force means.

3. In a well drilling apparatus including a derrick provided with a crown block and traveling block means operatively associated therewith, the provision of a safety device comprising: a control switch positioned adjacent to the crown block; a deadline connecting the crown block and traveling block; a weight slidably mounted on said deadline; a cable including a tension spring operably connected thereto along its length and a cable section limiting extension of said spring, said cable connecting the weight and the control switch to normally hold the switch in energized position and to maintain said switch non-responsive to normal movement of the traveling block; and means operably associated with the traveling block means for lifting said weight and opening the control switch when the traveling block is in proximity to the crown block.

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