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WARNING DEVICE FOR AN OIL WELL DERRICK

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by

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The present invention relates to warning devices, and, more particularly, to warning devices for an oil well derrick to indicate the approach of a traveling block to the top of a derrick.

In the drilling of oil wells it is frequently necessary to handle extended lengths of drill pipe and for this purpose the usual derrick is provided with a traveling block which comprises a multiple pulley arrangement with a lifting hook to lift and lower drill pipe. In the usual arrangement, a motor driven draw works is provided on the floor of the derrick, and hoisting cables are connected to the traveling block by a series of pulleys rotatably mounted on the crown block of the derrick. However, in the operation of the draw works during the lifting of pipe, it is often necessary for the operator of the draw works to bring the traveling block within a very short distance of the crown block of the derrick. Due to the weight and size of the traveling block and the fact that the draw works operator is generally located on the floor of the derrick, there is a very serious danger of the traveling block striking the top of the derrick and damaging the equipment, or, as in a few cases, completely destroying the derrick with the consequent hazards of possibly injuring or killing the drill crew working on the floor of the derrick.

It is therefore an object of the present invention to provide a device for warning the operator of the draw works of the approach of the traveling block to the crown of the derrick.

It is a further object of the invention to continuously warn the operator of the draw works when the traveling block is near the top of the derrick.

Further objects and advantages of the invention will become apparent from the following description taken in conjunction with the accompanying drawings of a typical embodiment of the invention.

The drawing is a somewhat diagrammatic representation of the alarm device as applied to the draw works for an oil well derrick.

Referring to the drawing, a derrick 1 is shown diagrammatically mounted upon a platform 2 which carries a rotary table 3 through which drill pipe 4 passes into and out of the drill hole. A crown block 5 is provided at the top of derrick 1 by means of a pair of I-beams. The beams serve as supporting means for a shaft and a plurality of pulleys 6 which support traveling block 7 by means of cable 8. As shown, traveling block 7 has a shaft 9 for rotatably mounting a plurality of pulleys and is provided with a hook 10, which is adapted to engage the upper end of pipe 4. A draw works indicated generally at 18 comprises a motor 11 and a winch 12 mounted upon the platform 2. While controlling means for the draw works 18 is not shown in the drawing, it will be understood by those skilled in the art that controlling means will be provided at control panel 13 for governing the movement of winch 12 to raise and lower traveling block 7 and pipe 4 through cable 8 and pulleys 6.

As stated above, the operator of the draw works 18 is generally located on the platform 2 and is, therefore, not in a position to know exactly the location of traveling block 7 with reference to the top of the derrick, and due to the size and weight of traveling block 7 and the high rate of speed with which it is moved on occasion, there is a very great danger that the draw works 18 can pull cable 8 so that traveling block 7 is driven into contact with pulley and shaft arrangement 6 and either damage the crown block 5 or destroy the top of the derrick 1. There is also the possibility of cable 8 breaking so that traveling block 7 and pipe 4 may be free to fall.

In order to reduce this hazard to the members of the drilling crew and to prevent damage to the equipment, I have provided a warning device to indicate the presence of the traveling block when it approaches the top of the derrick. For this purpose I have provided a source of light 14 adjacent the top and at one side of derrick 1 connected to a suitable source of power, such as 110 volts A.C. Preferably, although not necessarily, a light directing means for concentrating light source 14 is provided by shield 15, thereby directing a beam of light across the top of the derrick as indicated by the arrows. A phototwlectric cell 16 is located adjacent the top of the derrick in opposed relationship to the light source 14 so that the light rays impinging upon cell 16 must pass through the center of the derrick whereby traveling block 7 may effectively interrupt the flow of energy from light source 14 to phototcell 16.

While the light beam is shown to traverse the top of the derrick perpendicular to the traveling block shaft 7', it will be understood that photocell 16 and light source 14 may be located so that the light beam will be parallel to shaft 7'. This location will depend upon where the maximum interrupting effect is achieved with minimum interference from cable 8.

A pair of wires 17 and 18 are connected between photocell 16 and amplifier 19 which is arranged to produce an operating voltage for coil 20 of relay 21, which is connected to amplifier 19 by wires 22 and 23. In the usual arrangement, amplifier 19 and relay 21 will be located in the housing of photocell 16; however, for the sake of clarity in the description of the present apparatus the amplifier and relay are shown within box 18 in the drawing. Amplifier 19 is connected to a source of power, such as a 110 volt source as shown, and relay 21 is adapted to connect the coil of time delay relay 24 to the 110 volt source.
by completing the connection between line 25 and line 26. The other side of the coil of time delay relay 24 is connected to the power source by means of line 27.

Time delay relay 24 is arranged to connect an audible signal means such as horn 28, as well as a visual signal alarm, such as a red light 29, located on the draw works control panel 13. In the present embodiment, armature 30 of time delay relay 24 is shown in contact with points 34 and 32, connected respectively to lines 26 and 33, so that line 32, which is connected to the audible signal, horn 28, is connected to the power source through line 26. The visual signal lamp 29 is directly connected to line 26, so that lamp 29 is continuously connected to the power source through lines 26 and 27 when relay 21 is actuated.

In addition to the signaling devices which may be operated by the interruption of the light beam, I have provided means for actuating the usual dynamatic brake used in this type of drilling apparatus. For this purpose, another relay 35 having its coil connected across lines 26 and 27 is adapted to close a set of contacts 36 and 37 connected in a control line for the brake.

In normal operation, the traveling block 7 will be traveling in proximity to the top of the derrick f, since an audible signal is given when the traveling block 7 is in proximity to the top of the derrick 1, since an audible signal is given when the traveling block 7 approaches the top of the derrick. If it is desirable to maintain the block near the top, a visual signal will still be present to indicate the danger of lifting the traveling block above its present position. In this way damage to the equipment or possible endangering of lives may be eliminated.

It will be obvious to those skilled in the art that variations and modifications may be made in this system, particularly with regard to the interconnection of the relay systems and the order in which the visual and audible signals are connected to the power source in response to the interruption of the light beam across the top of the derrick by the traveling block.

It will likewise be obvious to those skilled in the art that in place of the control for the dynamatic brake shown in the preferred embodiment, relay 33 may be utilized to operate a solenoid valve to close a steam line when a steam engine drive is used in place of motor 11. The same device may be used to ground the magnetos of a gas engine, to operate a magnetic clutch or to set an electric brake on any type of prime mover. Any of these operations may be obtained without interfering with the fundamental operations of the signaling equipment.

Such modifications and variations of the invention may be made without departing from the spirit and scope thereof, and I therefore intend to limit the invention only within the scope of the appended claim.

I claim:

In combination, an oil well derrick having a draw works in its base for raising and lowering a traveling block within the derrick adapted to handle drill pipe, a braking means for said draw works, a light source mounted adjacent the top of said derrick, light directing means for concentrating said light source into a beam of light which passes through substantially the center of said derrick and across the vertical path of said traveling block, a photoelectric cell mounted on the opposite side of said derrick and adjacent the top thereof to intercept said beam of light, amplifier means connected to said photoelectric cell responsive to the interruption of said light beam striking said photoelectric cell due to the interruption of said traveling block between said photoelectric cell and said light source, a visual alarm means and an audible alarm means, a time delay relay, another relay operable by said amplifier means to actuate said draw works braking means, said audible alarm means, and said time delay relay, said time delay relay actuating said audible alarm means for a predetermined time interval.

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