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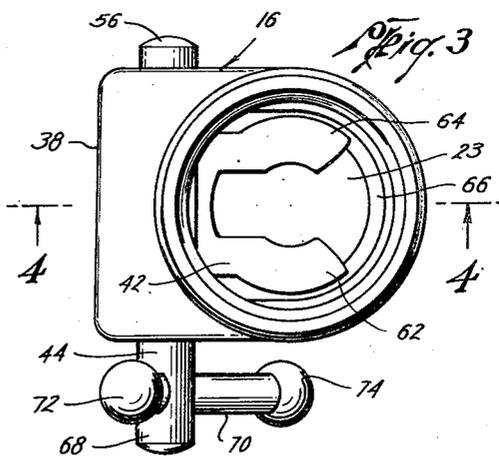
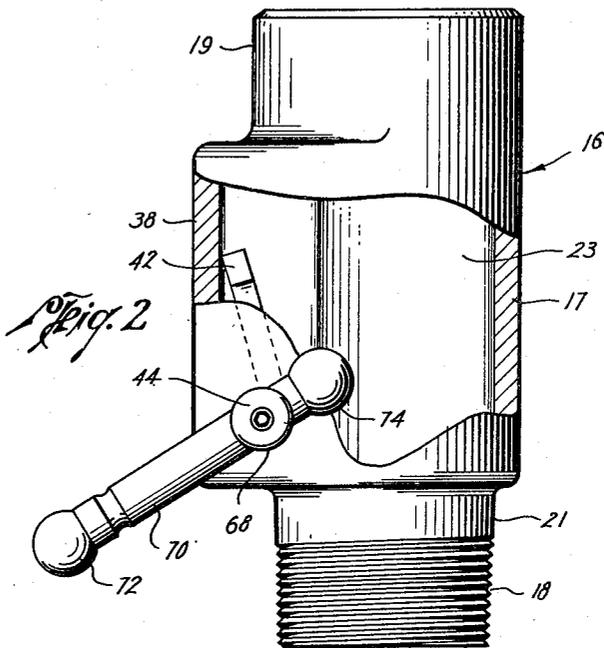
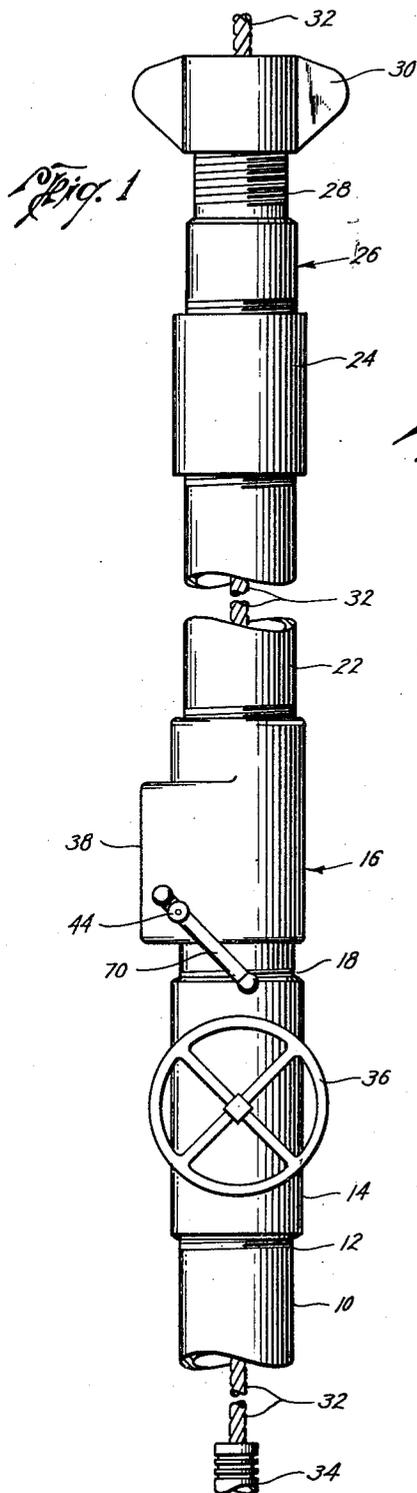
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SAFETY DEVICE FOR LINE-SUSPENDED WELL EQUIPMENT

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2 Sheets-Sheet 1



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SAFETY DEVICE FOR LINE-SUSPENDED WELL EQUIPMENT

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3 Claims. (Cl. 166—70)

This invention relates to a safety device for line-suspended well equipment, and more particularly to a device for use in connection with line-suspended tools and the like, to prevent accidental loss of such tools when the same are being withdrawn from a well.

The invention has particular application in the carrying out of operations in wells, such as oil wells, wherein it is frequently necessary to lower various kinds of implements, such as tools, instruments and the like, either in the open well, or while the well is under pressure. Such implements are usually lowered into the well attached to a line, such as a cable or wire, by means of a rope socket or the like, and the line is customarily marked in some convenient manner to indicate to the operator when the implements are about to reach ground level. Great difficulty is encountered at times, however, in withdrawing such line-suspended equipment from the well, because of the obliteration of the marking means, so that the operator does not become aware of the fact that the implements have reached the top of the well, and the implements are raised into contact with some part of the well head apparatus, which results in breaking the line or pulling the line out of the rope socket. Under these conditions the implements are frequently damaged, or may be lost in the well, necessitating time consuming and costly fishing operations to recover the same.

It is the chief object of the present invention to provide a safety device for use with line-suspended well equipment, whereby loss of such equipment in a well is prevented when the same is being withdrawn from the well.

The invention also contemplates the provision of a safety device adapted to be incorporated in apparatus commonly known as a well lubricator, as a part of such apparatus, to prevent the accidental falling or lowering of line-suspended well equipment into a well, either prior to the lowering of such equipment into the well, or during the withdrawal of the same therefrom.

Another object of the invention is the provision of a device of the character referred to, which may be placed in condition to operate automatically to prevent accidental return of line-suspended equipment into a well, after the same has been withdrawn therefrom.

A further object of the invention is the provision of a safety device which is adapted to be operated by engagement with line-suspended well equipment during the withdrawal of such equipment from a well, to permit the equipment to be withdrawn, but which operates automatically when the equipment has been raised past the device, to prevent return of the equipment to the well.

A further object of the invention is to provide a safety device of the character referred to, a movable supporting member adapted to be moved to an inoperative or open position, wherein the same will not interfere with the free passage of implements into or out of a well, or to an operative or closed position, in which it is co-operable with the implements to permit withdrawal of

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the same from the well past the device, but is effective to prevent accidental return of the implements to the well.

A still further object of the invention is the provision of a safety device of the character described, which is of simple design and rugged construction, capable of withstanding the conditions of use and rough treatment to which such a device is likely to be subjected.

The invention will best be understood from the following detail description, constituting a specification of the same when taken in conjunction with the annexed drawings wherein—

Figure 1 is an assembly view, showing the invention applied to one form of well head apparatus with which it is adapted to be used;

Figure 2 is a side elevational view, on a somewhat enlarged scale, partly broken away and partly in cross section, illustrating a preferred form of the invention, and showing the same in inactive position;

Figure 3 is a top plan view of the invention, as seen in Figure 2, but showing the same in its active condition;

Figure 4 is a cross-sectional view, taken along the line 4—4 of Figure 3; and

Figure 5 is a cross-sectional view, taken along the line 5—5 of Figure 4.

Referring now to the drawings in greater detail, wherein like numerals of reference designate the same parts throughout the several views, the invention is illustrated in Figure 1 in its application to well head apparatus of the type known as a well lubricator. It will be understood, however, that the invention is capable of broad application, and may be used in connection with any convenient well head apparatus, whether applied to the open well, or to a well which is under pressure.

As seen in Figure 1 the well lubricator apparatus is connected to the upper end of the well tubing, indicated at 10, such tubing having an externally threaded portion 12 to which the lower end of the casing of a master valve 14 is threadably secured. The safety device or trap 16, constituting the present invention is externally threaded at its lower end, at 18, for threadable attachment to the upper end of the valve casing 14, and is internally threaded at its upper end, at 20, to threadably receive the lower end of a section or joint of pipe 22.

A collar 24 is threaded upon the upper end of the joint of pipe 22, and a linewiper, generally indicated at 26, of conventional construction, is threadably attached to the upper end of the collar. The linewiper 26 has an externally threaded upper end portion 28, upon which a packing nut 30 is threaded, by which the packing of the line wiper may be adjustably tightened about a cable or line 32, which extends completely through the lubricator and safety device, and by which line-suspended implements may be lowered into the well. A rope socket 34, of conventional design is attached to the line 32, by which any desired type of implement may be secured to the line for lowering into the well. Line 32 extends upwardly above the lubricator to any desired distance, and is adapted to be operated by any suitable winding mechanism, not shown.

The master valve 14 is adapted to be opened and closed by means of a hand wheel 36, or other convenient means. Lubricator apparatus of the type described above is adapted to be operated by winding up the line 32, until the rope socket 34 is within the joint of pipe 22, whereupon the master valve 14 may be closed, and the collar 24 removed, to permit the attachment of any desired implement to the rope socket.

When attached to the line, the implement may be inserted in the joint of pipe 22, and the collar 24 with the line wiper 26 replaced on the pipe. The master valve 14 may then be opened, and the implement lowered into the

well to the desired distance, without the escape of pressure fluid from the well.

In removing from a well line-suspended equipment which has been lowered therein in the manner above described, the line is wound up until the equipment has been drawn into the joint of pipe 22 a sufficient distance to enable the master valve 14 to be closed, whereupon the collar 24 may again be disconnected, and the equipment removed and detached from the rope socket. In winding up the line for the purpose of such removal of the equipment, great care is necessary to prevent moving of the equipment too far into the lubricator, whereby the rope socket 34 may engage the line wiper and result in breaking the line, or pulling the same out of the rope socket. Suitable marking means, such as a paint mark on the line is commonly used to indicate when the rope socket has entered the lubricator to the desired extent, so that the winding of the line may be controlled to prevent the overwinding of the same, but such marking frequently becomes obliterated from contact with well fluids, so that the operator is unable to determine when the equipment is in the lubricator, and the line is pulled out of the socket, resulting in loss of the equipment into the well. It is for the purpose of preventing such loss of the equipment that the safety device 16 is inserted in the lubricator, or applied in a similar manner to other suitable types of well head apparatus.

The safety device 16, in the present illustration, takes the form of a hollow casing 17, which is conveniently formed of tubular shape at its upper and lower end portions, 19 and 21, respectively, and has an intermediate portion, indicated at 38, which may be somewhat larger in cross-sectional area, than the end portions. The casing is thus formed with a passageway 23, therethrough, through which line-suspended well equipment may be passed in inserting such equipment in and removing it from a well. As previously stated, the lower end 21 of the casing 17 is externally threaded at 18, for threadable attachment to the upper end of the master valve 14, and is internally threaded, as at 20, at its upper end to receive the lower end of the joint of pipe 22.

The enlarged portion 38 of the casing 17 provides a recess 40 at one side thereof, and within this recess a generally U-shaped supporting member or gate 42 is pivoted at one end, by means of a pin or shaft 44, or other similar supporting member, which extends through opposite walls of the casing. Pin 44 may be rotatably supported in bearings 46 and 48, respectively, in the opposite walls of the casing, and may be provided with suitable packing means 50 and 52, respectively, to prevent leakage of fluids past the bearings. The pin may be externally threaded at one end, as indicated at 54, and a cap 56 is threaded thereon, which cap is received in the bearing 48, in order that the pin may be readily removed and replaced when desired.

The U-shaped member or gate 42 is provided at the bottom of the U with an enlargement 58, which is perforated to receive the pin 44, and the member may be suitably fixed to the pin, as by means of a key 60, so that the member rotates with the pin.

The pivoted member or gate 42, also has spaced arms 62 and 64, between which the line 32 may freely pass, and the member is adapted in its active position to seat on an internal shoulder 66 within the enlarged portion of the casing, which limits downward movement of the member.

One end 68, of the pin 44 extends outwardly beyond the casing of the safety device, and is perforated to receive an actuator member or handle 70, which is provided with suitably weighted end portions 72 and 74. The end 68 of the pin 44 is also provided with a longitudinal bore 76, within which suitable detent mechanism is located, such as the ball 78, which is urged inwardly by a coil spring 80, which is retained in the bore by a threaded plug 82. The handle 70 also has an annular

groove 84, into which the ball 78 fits, to releasably hold the handle in one position.

In making use of the invention the safety device is connected into the lubricator apparatus in the manner described above, and the handle 70 is brought to the position indicated in Figures 1, 3 and 5, with the ball 78 extending into the groove 84, to retain the handle in this position. In this condition of the safety device the pivoted member or gate 42 is in its active position, as best seen in Figures 4 and 5, and is retained in such position by the weight 74 of the handle 70.

The master valve 14 may now be closed by operation of the handwheel 36 and the collar 24 disconnected from the upper end of the joint of pipe 22. The desired implement is connected to the line 32 by means of the rope socket 34 and inserted in the joint of pipe 22, after which the collar 24 is replaced. The master valve 14 may now be opened without danger of the pressure in the well escaping, and upon raising of the pivoted member or gate 42 to an inactive position out of the passageway 23, as shown in Figure 2, the implement may be lowered into the well. The member 42 may thereafter be allowed to return to its active position, and will remain in such position under the influence of the weight of the handle 70.

Upon withdrawal of the implement from the well, the same engages the member 42, and lifts the member, to permit passage of the implement through the casing 17 into the joint of pipe 22. As soon as the implement passes the member 42, the member falls back to its active position, under the influence of the weight of the handle 70, and prevents downward movement of the implement into the well.

In the event that the operator is not warned of the entrance of the implement into the lubricator, in time to prevent overwinding of the line 32, and the implement comes into forcible contact with the line wiper, resulting in breaking of the line, or pulling the line out of the rope socket, the safety device prevents loss of the implement in the well.

The implement may be removed from the lubricator by closing the master valve 14 and removing the collar 24 from the joint of pipe 22, in the manner previously described.

In the event that it should become desirable or expedient to maintain the pivoted member 42 in its inactive position, the handle 70 may be moved to the position indicated in Figure 2, wherein the weighted end 72 is effective to rotate the pin in a counterclockwise direction, as seen in Figure 2, to move the member or gate 42 to its inactive position, and retain the same therein. It will be seen that the safety device is normally maintained in active position, and that some positive act is necessary on the part of the operator when it is desired to move the pivoted member to its inactive position, or place the device in a condition wherein it is not effective to prevent entrance of an implement into the well.

It will thus be seen that the invention as described above, provides a safety device which is of simple design and certain in operation to effectively prevent the loss of line-suspended well equipment, due to accidental overwinding of the line in withdrawing such equipment from the well.

The invention has been described in connection with its application to a particular type of well head apparatus, but it will be understood that this is intended by way of illustration only, and that the device may be applied with equally satisfactory results to many different types of well head apparatus, wherever it may be desired to prevent the loss of line-suspended well equipment. It will also be apparent that numerous changes may be made in the construction and arrangement of the various parts,

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without departing from the spirit of the invention, or the scope of the appended claims.

Having thus clearly shown and described the invention, what is claimed as new and desired to secure by Letters Patent is:

1. In a safety device for use with well head apparatus to prevent downward movement of line-suspended well equipment into a well, a hollow casing having a passageway for the movement of line-suspended equipment upwardly and downwardly therethrough, a shaft rotatably mounted on and extending into and outwardly beyond the casing, a gate mounted on the shaft in the casing and movable with the shaft to one position to open said passageway and to another position to close said passageway against downward movement of said equipment therethrough, and means slidably mounted on the shaft exteriorly of the casing and movable to one position for actuation under the influence of gravity to rotate the shaft in one direction to close the gate and to another position for actuation under the influence of gravity to rotate the shaft in the other direction to open the gate.

2. In a safety device for use with well head apparatus to prevent the downward movement of line-suspended well equipment into a well, a hollow casing having a passageway for the movement of line-suspended equipment upwardly and downwardly therethrough, a shaft rotatably mounted on and extending into and outwardly beyond the casing, a gate mounted on the shaft in the casing and movable with the shaft to one position out of the path of movement of said equipment in said passageway and to another position to close the passageway against downward movement of said equipment therethrough, said gate having an opening therein positioned to receive a line extending axially through said passageway, and

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means slidably mounted on said shaft exteriorly of the casing and movable to one position for actuation under the influence of gravity to rotate the shaft in one direction to close the gate and to another position for actuation under the influence of gravity to rotate the shaft in the other direction to open the gate.

3. In a safety device for use with well head apparatus to prevent downward movement of line-suspended well equipment into a well, a hollow casing having a passageway for the movement of line-suspended equipment upwardly and downwardly therethrough, a shaft rotatably mounted on and extending into and outwardly beyond the casing, a gate mounted on the shaft in the casing and movable with the shaft to one position to open said passageway and to another position to close said passageway against downward movement of said equipment therethrough, means including an actuator element slidably mounted on the shaft exteriorly of the casing and movable to one position for actuation under the influence of gravity to rotate the shaft in one direction to close the gate and to another position for actuation under the influence of gravity to rotate the shaft in the other direction to open the gate, and means for releasably retaining said element in position to close said gate.

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