

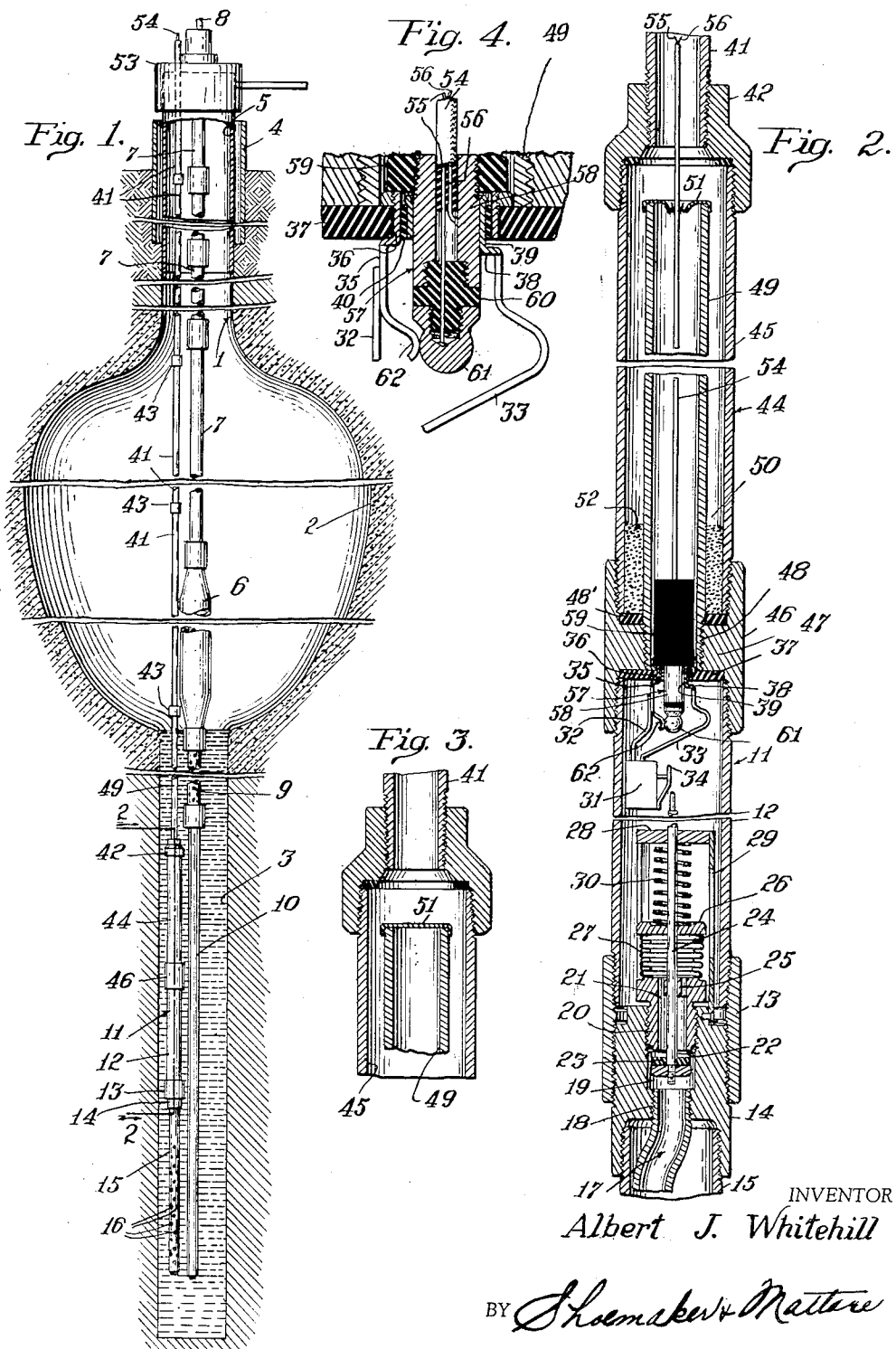
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DIRT GUARDS

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DIRT GUARDS

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This invention relates to a dirt guard and while it is particularly adapted for use in connection with control means for a well pump, it is to be understood that it is not limited to this particular use.

This device has been shown installed in connection with a control for the pump of an oil well wherein the control mechanism is located at the lower end of a string of tube sections. When such an apparatus is installed, the control mechanism is connected with a tube section to which other tube sections are connected, one above another, and lowered into the well. It has been found that as the tube sections are screwed into engagement with each other, scale, rust, dirt and other foreign matter is loosened and drops downwardly through the string of tube sections into the casing of the control mechanism and very often accumulates therein to such an extent that the control mechanism will be clogged and prevented from operating.

It is, therefore, one object of this invention to provide a dirt guard which may be connected with the upper end of the casing for the pump control mechanism and have its upper end connected with the lower end of the lowermost tube section and thus serve to catch dirt which drops downwardly through the string of tube sections and very effectively prevent this dirt from entering the casing of the control mechanism.

It is another object of the invention to so form the dirt guard that its lower end may be connected with the upper end of the control mechanism casing by a coupling into which the lower end of a guard tube is screwed and thus form within the housing of the guard a dirt receiving chamber which surrounds the guard tube and is thus very effectively prevented from entering the casing of the control mechanism.

The invention comprehends a guard having a centrally located inner tube defining the dirt receiving chamber and having its upper end initially closed by a disk formed of thin paper, plastic or other frangible material which is strong enough to prevent it from being broken by dirt entering the housing of the guard through the upper end thereof but capable of being torn or broken by a jack plug passed downwardly through the string of tube sections and into the guard tube to the lower end thereof where it serves to complete a circuit by means of which current is delivered to a well pump when needed.

Another object of the invention is to so form the guard that it may be readily applied to the upper end of the casing of a pump control of known construction and thus is not limited to use with controls of a special construction.

This improved dirt guard has been shown installed in connection with a pump control mechanism of the type constituting the subject matter of Patent No. 2,690,713, dated October 5, 1954 but it is to be understood that it is not limited to this particular use and may be used wherever found practical in an apparatus including control mechanism enclosed in a casing from which dirt should be excluded.

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With the above and other objects in view, the invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings and pointed out in the claims hereto appended, it being understood that various changes in the form, proportions, and minor details of construction, within the scope of the claims, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

A practical embodiment of the invention is illustrated in the accompanying drawings, wherein:

Fig. 1 is a view taken vertically through an oil well and showing mechanism therein in elevation, with the improved guard installed between a string of tube sections and a control for the circuit of a motor for operating the pump in the well;

Fig. 2 is a vertical sectional view upon an enlarged scale, taken along the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary sectional view showing the upper end of its guard tube closed by a disk of thin sheet material before this disk or shield has been broken;

Fig. 4 is a fragmentary sectional view illustrating the manner in which the jack plug completes the circuit for the pump motor.

The well, which is indicated in general by the numeral 1, is bored vertically downwardly through the various strata of the earth until it is of such depth that the oil bearing strata has been reached and penetrated and a shot hole 2 is then formed, after which the boring is continued to form a pocket 3 extending downwardly from the bottom of the shot hole as deep as necessary. The pipe 4 is then installed as a liner for the well hole and through this liner is lowered the casing 5. The pump mechanism is then lowered through the casing and includes the usual working barrel 6 connected with the lower end of the lower one of a string of tube sections 7 through which passes a sucker rod or pump rod 8 by means of which conventional pump mechanism in the barrel 6 is operated. A perforated pipe section 9 constituting a strainer extends downwardly from the lower end of the working barrel 6 and has its lower end connected with an anchor pipe or tube 10. This is all conventional structure and it will be understood that the well may have therein any conventional type of pumping mechanism, having actuating mechanism at the top of the well including a driving motor which is to be operated when necessary.

In order to control operation of the pump mechanism at the top of the well, there has been provided a control device 11 which is of the construction shown in Patent No. 2,690,713 and disposed at one side of the pump mechanism as shown in Fig. 9 of the said Patent No. 2,690,213. This control mechanism has a vertically disposed cylindrical casing 12 having its lower end screwed into a coupling 13 by means of which it is connected with a plug or nipple 14 having threaded engagement with the upper end of an anchor 15, the anchor being perforated as shown at 16 so that oil in the pocket 10 may enter the anchor and flow upwardly through the expansion tube 17. This tube has its upper end screwed into a threaded opening 18 leading from the bottom of a bore 19 formed vertically in the plug or nipple 14. A plug 20 is screwed downwardly into the upper end portion of the bore 19 and is formed with a vertically extending passage 21 surrounded at its lower end by a valve seat 22 for engagement by a valve disk 23 mounted upon the lower end of a valve stem 24. This valve stem passes vertically through the passage 21 and is slidably mounted through a spider 25 in the upper end of the passage 21. The valve stem is quite long and passes through a disk or collar 26 which is firmly secured to the valve stem and is welded or otherwise firmly secured to the upper end of a cylindrical bellows 27 having its lower end resting upon

and welded to the upper end of the plug. A guide disk 28 carried by an openwork frame 29 is mounted in the casing 12 in upwardly spaced relation to the collar 26 and between this guide disk 28 and the collar 26 is disposed a helical spring 30 which urges the collar 26 downwardly and thereby depresses the bellows 27 and holds the valve disk 23 off of the valve seat 22 until the pressure of oil within the bellows shifts the collar 26 upwardly and closes the valve.

A switch 31, which is a micro-switch, is mounted within the casing 12, and from this switch extend conductors 32 and 33 which are bridged when the switch 31 is closed by closing movement of its actuator 34 by contact therewith by the upper end of the valve stem 24. The upper end of the conductor 32 is secured to a finger 35 formed of conductive material and having its upper end integrally connected with a ring 36 passing through an insulating disk 37 which rests upon the upper end of the casing 12. The upper end of the conductor 33 is connected with an arm 38 extending from the lower end of an inner conductive ring 39 disposed within the ring 36 and separated therefrom by an insulation 40.

In previous installations, the upper end of the casing 12 has been directly connected with a string of tube sections 41 by a coupling 42. This has been found objectionable as, when the tubes of the string 41 are connected with each other by the internally threaded couplings 43, dirt, rust, scale or other foreign matter which has accumulated in the tube sections and their couplings will be loosened and fall downwardly through the string of coupled tube sections and into the casing 12, where it accumulates in the lower portion thereof and often is of such quantity that it will prevent the bellows from expanding and also prevent the helical spring from being compressed upwardly. Therefore, the valve stem cannot move upwardly and close the circuit by engagement with the actuating member 34 of the switch 31. Even if the bellows should be expanded sufficiently to close the switch 31, the accumulated dirt and other foreign matter are liable to prevent return of the bellows to its normal position and the circuit for the motor will not be broken. Proper operation of the motor and the pump mechanism driven thereby is important as the pump must be operated when the oil has accumulated in the shot hole to a predetermined height and this pumping operation must be stopped when the level of oil in the shot hole has been reduced to the level shown in Fig. 1.

In accordance with the present invention a guard 44 is provided, said guard being installed between the control 11 and the lower end of the string of tube sections, very effectively prevents dirt from entering the upper end of the casing 12 of the control. This guard has a cylindrical housing 45 formed from a pipe section of the same diameter as the pipe section from which the casing 12 is formed. Therefore, this tubular housing may have its lower end screwed into the upper portion of a coupling 46 which is screwed upon the upper end of the casing 12, instead of applying the upper end of the casing 12 to the coupling 42 as previously done. A web 47 formed with a centrally located threaded opening 48 is formed integral with the coupling 46 midway the length thereof and the lower surface of this web 47 bears against the gasket 37 and holds the gasket or disk 37 firmly gripped between the web and the upper end of the casing. There has also been provided a second disk 48' of insulation which rests upon the upper surface of the web 47 and is engaged by the lower end of the housing 45 in order to form a tight joint. The housing 45 may be of any length desired and within this housing is disposed a vertically extending guard tube 49 of such length that when its threaded lower end portion is screwed into the threaded opening 48 of the web 47, its upper end will be spaced downwardly from the upper end of the housing 45. It should also be noted that the diameter of the guard tube is smaller than the

diameter of the housing, the difference in diameter between this tube and the housing being such that when the tube is screwed into the threaded opening 48, it will be spaced from the walls of the housing a sufficient distance to form a dirt receiving chamber 50 which surrounds the tube.

Dirt and other foreign matter which drops downwardly through the string of tubes as the tubes are connected one with another and lowered into the well, must be prevented from entering the upper end of the guard tube. In order to do so there has been provided a shield 51 which is applied to the upper end of the guard tube. This shield may be formed from a disk of thin paper, plastic, or other sheet material which may be easily torn or shattered and has its marginal edge portions turned downwardly and tightly secured about the guard tube. It will be understood that while the shield is formed of paper or other material which is frangible, it is sufficiently tough to prevent it from being torn or shattered by dirt, scale or rust loosened from the tube sections and falling downwardly through the string of tubes as the tube sections are coupled to each other. This dirt or other foreign matter, upon striking the shield, will be deflected toward sides of the housing 45 and drop downwardly into the chamber 50 where it accumulates in the lower portion thereof about the guard tube as shown at 52 in Fig. 2. After the string of tubes has been completely formed and is of such length that its upper end will project above the head 53 of the well casing, a cable 54 containing the usual conductor wires 55 and 56 is let downwardly through the string of tube sections. Connected with the lower end of the cable 54 is a jack plug 57 which may be of any conventional formation. In the present illustration this jack plug has a tubular body 58 into which the end of the cable 54 is fitted. This tubular body 58 is formed of conductive material and upon its upper end is screwed a nut 59 which is formed of insulation and serves to force the split upper end portion of the tubular body into tight gripping engagement with the cable. The lower end of the wire 56 engages the body 58 and the lower portion of the wire 55 passes through a nipple 60 which is formed of insulation and is screwed into the lower end of the body 58 of the plug 57. At its lower end the wire 55 is secured to a cap 61 which is screwed upon the lower end portion of the nipple and is engaged with the arcuate lower end portion or bill 62 of the conductor 35.

Referring particularly to Fig. 4, it will be seen that the diameter of the jack plug is such that it may readily pass downwardly through the inner ring 39 and thus form the electrical connection between the wires 55 and 56 and the conductors 35 and 33. It will also be noted that when the cable is lowered through the string of tubes, which may be several hundred feet in length, the jack plug will readily tear its way through the paper shield or disk or break the disk into fragments if it is formed of brittle plastic or a similar material, and then pass downwardly through the guard tube to the lower end thereof and assume the position shown in Figs. 2 and 4.

As previously stated, the guard is not limited to use in connection with a control for a motor of a pump operating mechanism, as it may be used in connection with any structure wherein movable elements are enclosed in a casing from which dirt should be excluded. One such alternate use of the guard would be as a dirt excluder for the working barrel 6 in which case the guard would be mounted between the upper end of the working barrel and the lower end of the lowermost casing section 7.

What is claimed is:

1. In a control for a well pump, a casing, a switch and actuating mechanism for the switch in said casing, a string of tube sections coupled in end-to-end engagement with each other and being of a length to extend to the top of a well in which the casing is disposed at the bottom of the well; and a dirt excluder between said

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casing and the bottom tube section, said dirt excluder comprising a vertically disposed cylindrical housing, couplings connecting ends of said housing with the lower tube section and the upper end of said casing, the lower coupling having therein a partition formed with a centrally located threaded opening, a guard tube disposed vertically in said housing and having its lower end screwed into the threaded opening and its upper end spaced downwardly from the upper end of the housing, space within the housing about said tube constituting an annular dirt-receiving chamber, and a temporary closure for the upper end of said tube serving to prevent passage of foreign matter through the tube into the casing during assembling of the tube sections, said closure being formed of frangible material adapting it to be ruptured by a conductor passed downwardly through the string of tube sections into the housing and through the tube therein.

2. In a control for a well pump, a casing, a switch and actuating mechanism therefor in said casing, a string of tube sections coupled in end-to-end engagement with each other and disposed over said casing, and a dirt excluder comprising a housing disposed between the casing and the string of tubing sections and connected therewith by upper and lower couplings, a web in the lower coupling formed with an opening, a guard tube disposed vertically in said housing and having its lower end mounted in the opening in the web and communicating with the casing, said guard tube being spaced from walls of the housing and thereby providing a dirt-receiving chamber about the guard tube, and a closure blocking the upper end of the guard tube and formed of frangible material adapting it to be ruptured by a conductor passed downwardly through the string of tube sections and through the guard tube.

3. In a control for a well pump, a casing, a switch and its actuating mechanism in said casing, a string of coupled tube sections disposed vertically over said casing, and a dirt excluder comprising a housing disposed between and connected with the casing and the lowest tube section, a vertical guard tube in said housing having its lower end communicating with said casing and being spaced from vertical walls of the housing, a transversely extending wall portion encompassing a lower portion of the guard tube and closing the space between the same and vertical walls of the housing and providing therewith a dirt-receiving chamber in the housing about the guard tube, and a temporary closure for the upper end of the guard tube formed of frangible material adapting it to be ruptured by a member passed downwardly through the string of tube sections into the housing and into the guard tube.

4. In a control for a well pump, a casing, a switch and its actuating mechanism in said casing, a string of coupled tube sections disposed vertically over said casing, and a dirt excluder comprising a housing disposed between and connected with the casing and the lowest tube section, a hollow guard member in said housing communicating with the casing and having an open upper portion spaced from the top of the housing, said guard member being spaced from walls of the housing, a transversely extending wall portion encompassing a lower portion of the guard member and closing the space between the same and vertical walls of the housing and providing therewith a dirt-receiving chamber about the guard member, and a temporary closure for the open upper portion of the guard member serving to prevent dirt falling into the housing from passing through the guard member into the casing.

5. The structure of claim 3 wherein the temporary closure consists of a disk of thin sheet material adapted to be destroyed by a member passed downwardly into the guard tube.

6. A dirt excluder for a switch casing comprising a vertical cylindrical housing, couplings connected with

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upper and lower ends of said housing, the lower coupling having therein a horizontal web formed with a central threaded opening, a guard tube disposed vertically in said housing and having its upper end spaced downwardly from the upper end of the housing and its lower end screwed into the threaded aperture in the web and thereby supported in spaced relation to walls of the housing and providing an annular dirt-receiving chamber in the housing about the guard tube, and a temporary closure for the upper end of said guard tube consisting of a disk of thin readily destructible sheet material.

7. A guard for preventing entrance of foreign matter into a switch casing comprising a housing having an open top adapted for connection with a tubular conduit for conductor wires, a coupling for connecting the lower end of said housing with a switch casing, said coupling having a vertical bore, a guard tube disposed vertically in said housing having its lower end mounted in said bore and being spaced from vertical walls of the housing, said coupling having a part encompassing a lower portion of the guard tube and closing the space between the same and vertical walls of the housing and providing therewith a chamber in the housing about the guard tube, and a temporary closure for the upper end of said guard tube formed of frangible material.

8. A guard for preventing entrance of foreign matter into a switch casing while installing the switch casing, said guard comprising a housing open at its top and bottom, a guard tube disposed vertically in said housing and having its lower end portion connected with the lower part of the housing and being spaced from vertical walls thereof, a transversely extending wall portion encompassing a lower portion of the guard tube and closing the space between the same and vertical walls of the housing and forming therewith a chamber in the housing about the guard tube, and a frangible closure for temporarily closing the upper end of the guard tube.

9. A guard for preventing entrance of dirt into a switch casing while installing the switch casing, said guard comprising a housing adapted to be mounted between a switch casing and a conduit for electric wiring, a guard tube disposed vertically in said housing and open at upper and lower ends for passage of electric wiring through the tube, said tube in the housing spaced from vertical walls thereof, a transversely extending wall portion encompassing a lower portion of the guard tube and closing the space between the same and vertical walls of the housing and forming therewith a dirt-receiving chamber about the tube, and a temporary closure for the upper end of said tube.

10. A guard for preventing entrance of dirt into a switch casing while installing the switch casing, said guard comprising a housing adapted to be mounted between a switch casing and a conduit for electric wiring, a tubular member in said housing spaced from the vertical walls thereof providing a passage for electric wiring, said member being spaced from the vertical walls of the housing, a transversely extending wall portion encompassing a lower portion of said tubular member and forming therewith a dirt-receiving chamber, and a barrier for said member adapted to be rendered inoperative by passage of electric wiring through the said member.

11. A casing, mechanism in said casing having movable parts, a string of connected tube sections above said casing, and a guard between said casing and said string of tube sections comprising a housing connected with said casing and the lowest one of the string of tube sections and at its top communicating with the said lowest tube section, a guard tube mounted vertically in said housing in spaced relation with the vertical walls thereof and establishing communication between the housing and said casing, a transversely extending wall portion encompassing a lower portion of the guard tube and closing the space between the same and the vertical walls of the housing and providing therewith a dirt receiving cham-

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ber about the guard tube, and a closure for the upper end of said guard tube serving to prevent dirt passing downwardly through the guard tube into said casing while assembling the string of tube sections.

12. A casing, mechanism in said casing having movable parts, a string of coupled tube sections above said casing, and a guard device between said casing and the lowest tube section connected therewith and having an opening therethrough providing for communication between said casing and said last mentioned tube section, said guard device including an openable closure means for the opening therein initially closing off communication between said lowermost tube section and said casing and serving to prevent dirt passing from the string of coupled tube sections into the casing and clogging the mechanism therein, said guard device having a dirt receiving chamber bordering said closure means.

13. A casing, mechanism in said casing having movable parts, a string of coupled tube sections above said casing, and a guard between said casing and the string of tube sections comprising a housing having an open upper end coupled to and communicating with the lowest one of the string of tube sections, a coupling connecting said housing at its lower end with the top of said casing, said coupling having a transverse wall portion formed with a port located inwardly of the vertical walls of the housing, a guard tube open at upper and lower ends disposed vertically in said housing about said port in spaced relation with the vertical walls of the housing, a transverse wall portion encompassing a lower portion of the

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guard tube and closing the space between the same and the vertical walls of the housing and providing therewith a dirt-receiving chamber within the housing about the guard tube, and a closure for the upper end of said guard tube constituting a shield serving to prevent dirt passing through the guard tube and into said casing while assembling the string of tube sections.

14. The structure of claim 13 wherein the shield for the upper end of the guard tube is a temporary closure member adapted to be rendered inoperative by a member passed downwardly through the string of tube sections and the guard tube after the tube sections have been assembled.

15. The structure of claim 13 wherein the shield is formed of frangible material adapting it to be rendered inoperative by a member passed downwardly through the coupled tube sections and into the guard tube.

16. The structure of claim 13 wherein the shield consists of a sheet of thin frangible material covering the upper end of the guard tube and having marginal portions secured about the said guard tube.

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