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DEVICE FOR ELIMINATING GAS LOCK IN PUMPS

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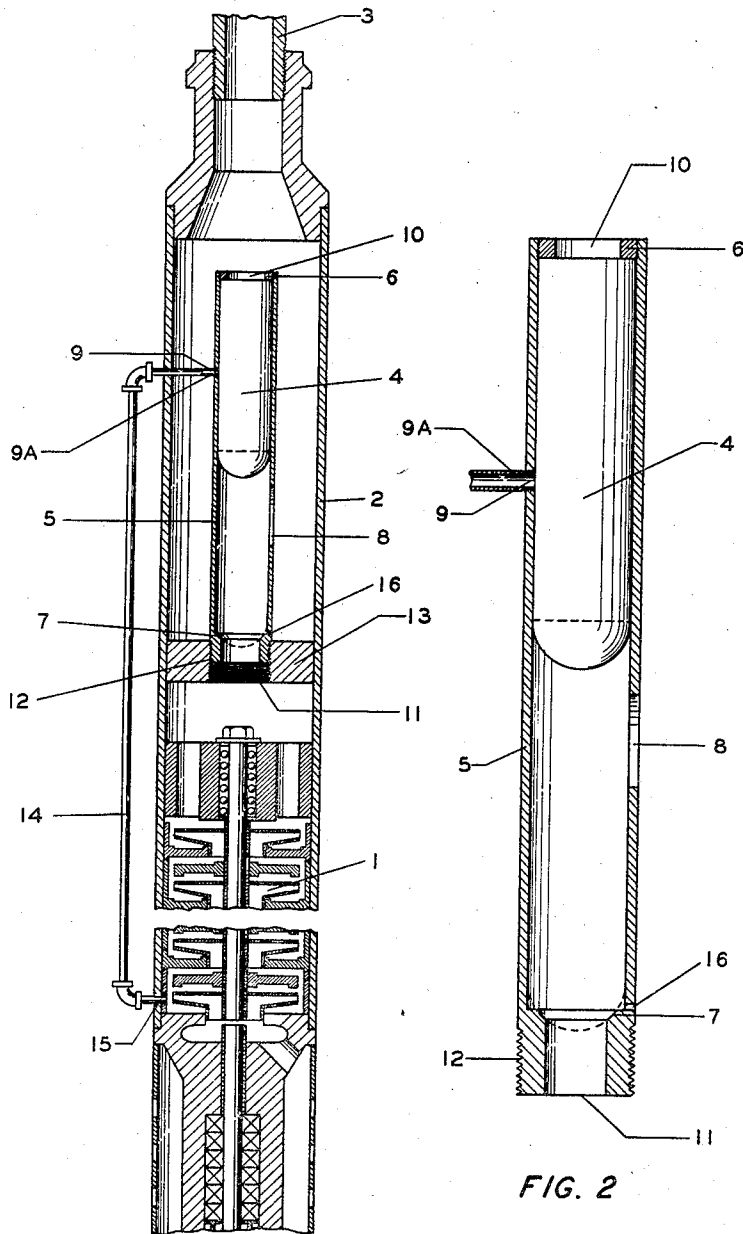


FIG. 1

FIG. 2

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DEVICE FOR ELIMINATING GAS LOCK IN PUMPS

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4 Claims. (Cl. 103—203)

This invention relates generally to pumping systems and more particularly to a device to be installed in a pumping system for remedying and relieving gas lock conditions occurring in deep well submergible pumps.

Heretofore, the only known method of eliminating gas lock conditions in pumps having the pumping motor below the fluid level of the well, has been to shut the unit down, waiting for fluid to drain back through the pump and then re-starting the pump. The time that it takes to perform this operation requires approximately an hour and a half. Another hour is required for the fluid to again reach the top. Thus, approximately two to three hours are wasted for every occurrence of gas lock condition. Since gas lock conditions are common occurrences, considerable time is lost in eliminating the condition with a consequent loss in economy in production of oil wells.

A further disadvantage resulting in shutting down the pumping unit is the possibility of sending up the pump.

Shutdown of the unit also causes possible damage to the pumping motor due to the high starting current required for re-starting the motor.

This invention overcomes the above and other disadvantages by providing automatically operating means for relieving the gas lock condition without necessitating the shut down of the pump. Briefly described, my invention comprises the provision of a separate passageway in the pump casing communicating with the usual fluid passageway through the casing, and also communicating with the lower portion of the pump. A movable obstruction is provided for selectively closing either of the passageways. When the pump is operating normally and there is no gas lock conditions, the movable obstruction will close off the first passageway with the fluid passing through the second passageway and out of the casing in the usual manner. However, when gas lock occurs, the obstruction will automatically move into position to open the first passageway and close the second passageway. As a result, fluid will flow back to the pump through the first passageway, reprime the pump and cause it to resume normal operation, all without necessitating the shut down of the unit.

Thus, a primary object of the present invention resides in the provision of a novel means for eliminating gas lock condition in pumping apparatus without shut down of the apparatus with a consequent saving in the cost of operation and with an increase in oil well production.

Further objects and advantages of the present invention are to provide means for eliminating gas lock conditions in pumping apparatus without injury to the pumping unit, prevention of possible damage to the pumping motor due to high starting current and decrease in the possibility of sanding up the pump as a result of the shut down of the unit.

Other objects and advantages of the invention will appear as the description of the drawing proceeds. I desire to have it understood, however, that I do not intend to limit myself to the particular details shown and described, but that I intend to include as part of my invention, all such obvious changes and modifications as would occur to persons skilled in this art.

This invention will be understood from the following detailed description taken in connection with the accompanying drawing wherein like reference characters denote corresponding parts throughout the several views.

In the drawing:

Figure 1 is a longitudinal section of the pumping unit showing the relative position of the novel valve with respect to the pump.

Figure 2 is an enlarged sectional view of the plunger and tube representing the main elements of the present invention.

Referring more particularly to the drawing, the present invention is shown as applied to a well known type of pump operating below the fluid level of a well and generally designated by the numeral 1. The pump is mounted within a cylindrical casing 2, said casing having a discharge tubing 3 at its upper end.

The invention proper consists of a plunger 4 and a barrel or tube 5, the plunger fitting into the barrel with a snug fit sufficient to prevent passage of fluid, yet capable of sliding to the lower end of the barrel through its own weight. Vertical movement of the plunger in the barrel is limited in its upward movement by stop 6 and in its downward movement by stop 7.

A port 8 is provided in the wall of the barrel approximately a third of the way from the lower edge of the barrel. Although a single port is illustrated in the drawing, it is readily apparent that more than one port may be used. An upper port 9 having an outlet pipe 9a is provided in the upper wall of the barrel approximately a third of the way from the top edge of the barrel. The barrel 5 is further provided with openings 10 and 11 in its upper and lower end walls respectively.

The barrel 5 is threaded at its lower end at 12

for threaded engagement with a partition member 13 permanently fastened to the inner surface of casing 2 as seen in Figure 1.

As shown in Figure 1, the entire barrel and plunger assembly fits just above the top thrust bearing inside the housing of the pump section. A vertical pipe 14 connects the outlet pipe 9a with the first stage of the pump through pipe 15.

During the normal operation of the pump, that is, with no gas lock condition in the pump, the plunger 4 will be forced against the upper stop 6, closing the upper port 9 and opening lower port 8. This permits the fluid from the pump to pass through opening 11 and port 8, and flow between the barrel and the casing into the discharge tubing 3.

When gas lock occurs, no fluid will pass through the pump and the pressure above and below the plunger 4 will be equalized. As a result, the plunger will drop of its own weight to the lower end of the barrel, limited in its fall by the lower stop 7. In this position, the plunger will close lower port 8 and open upper port 9. Fluid will then drain back through opening 10 and port 9 into the pipe 14 and down into the first stage of the pump at 15. This will reprime the pump and displace the gas in the impellers with fluid, causing the pump to again pick up fluid. The plunger 4 will then be forced upward to its previous position, closing port 9 and permitting the pump to resume its normal operation. A small hole 16 is provided at the lower end of the barrel 5 which permits fluid to evacuate into the annular space between said barrel and pump housing 2, as plunger 4 drops of its own weight to the lower end of the barrel. The hole 16 is of relatively small diameter so that it cannot interfere with the upward action of the plunger when fluid is again pumped into the barrel.

Thus it will be seen that the construction herein shown and described is well adapted to accomplish the objects of the present invention. It will be understood, however, that the invention may be embodied otherwise than here shown and that in the form illustrated, certain obvious changes in the construction may be made. Therefore, I do not wish to be limited precisely to the construction herein shown except as may be required by the appended claims considered with reference to the prior art.

Having thus described the invention, what is claimed is:

1. In combination, a casing, a pump within the casing at the lower end thereof, a partition mounted within the casing above the pump, said partition having an opening therethrough, an open ended tube mounted in said partition and communicating with said opening, said tube hav-

ing a port in the lower wall thereof, a port in the upper wall of said tube, a passageway connecting the upper port with the lower portion of the pump, and a plunger movable within the upper and lower ends of the tube, said plunger normally closing the upper port during the passage of fluid through the lower port and movable to the lower end of the tube to open the upper port and close the lower port upon interruption of the flow of fluid.

2. Means to prevent gas locking in pumps having a casing, a pump within the casing and a passageway connecting the upper portion of the casing with the pump comprising a port in the lower wall of the passageway, a port in the upper wall of the passageway, a conduit connecting the upper port with the lower portion of the pump and a plunger movable within the passageway, said plunger normally closing the upper port during the passage of fluid through the lower port and movable to the lower end of the passageway to open the upper port and close the lower port upon interruption of the flow of fluid from the pump and allow fluid to flow from the casing back to the pump.

3. Means to prevent gas locking in deep well submergible pumps having a casing, a pump within the casing, a tube connecting the upper portion of the casing with the discharge end of the pump, comprising a port in the lower wall of the tube, a port in the upper wall of the tube, a conduit connecting the upper port with the lower portion of the pump and a plunger movable within the tube, said plunger normally closing the upper port during the passage of fluid through the lower port and movable to the lower end of the tube to open the upper port and close the lower port upon interruption of the flow of fluid from the pump and allow fluid to flow from the casing back to the pump.

4. Means to prevent gas locking in deep well submergible pumps having a casing, a pump within the casing, a tube connecting the upper portion of the casing with the discharge end of the pump, comprising a port in the lower wall of the tube, a port in the upper wall of the tube, a conduit connecting the upper port with the lower portion of the pump, a plunger movable within the tube, means on said tube for limiting the upward and downward movement of the plunger, and said plunger normally closing the upper port during the passage of fluid through the lower port and movable to the lower end of the tube to open the upper port and close the lower port upon interruption of the flow of fluid from the pump and allow fluid to flow from the casing back to the pump.

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