

Jan. 28, 1941.

J. S. PAGE

2,229,986

AUTOMATIC PUMP CONTROL

Filed March 6, 1939

Fig. 1.

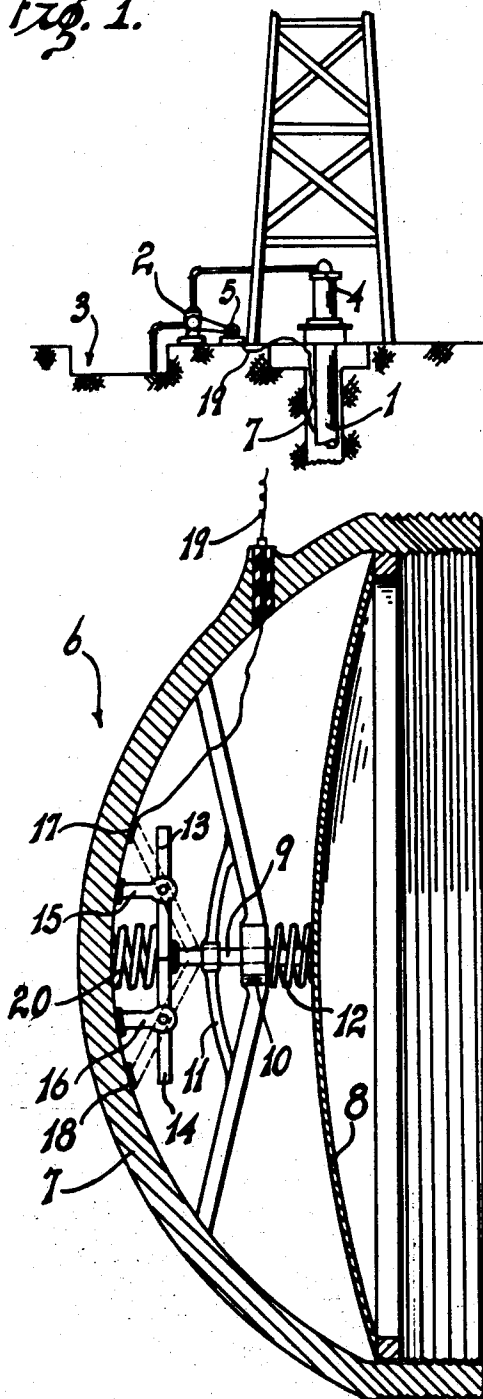


Fig. 2.

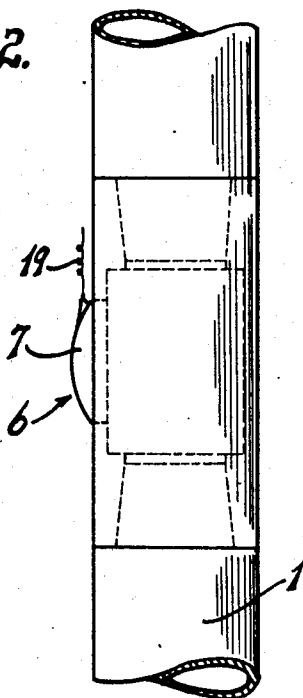


Fig. 3.

INVENTOR.
JOHN S. PAGE.
BY
H. A. Druckman
ATTORNEY.

UNITED STATES PATENT OFFICE

2,229,986

AUTOMATIC PUMP CONTROL

John S. Page, Long Beach, Calif.

Application March 6, 1939, Serial No. 260,084

8 Claims. (Cl. 255—24)

This invention relates to an automatic pump control, particularly applicable to an oil or gas well, in which the bored hole or casing is filled with fluid during the drilling operation.

5 An object of my invention is to provide an automatic pump control, whereby the level of the drilling fluid is maintained substantially constant during the drilling of an oil or gas well, and particularly during the operation of removing the drill pipe from the well. The upper top of the drill pipe is also kept free of drilling fluid.

10 A further object is to provide an automatic pump control of the character stated, which is simple in construction, effective in operation, and inexpensive to install and maintain.

15 Other objects, advantages and features of invention may appear from the accompanying drawing, the subjoined detailed description, and the appended claims.

20 *In the drawing*

Figure 1 is a diagrammatic view of my automatic pump control installed in the casing of an oil or gas well.

25 Figure 2 is a fragmentary side elevation of my automatic pump control mounted in the casing.

Figure 3 is a longitudinal, sectional view of my pump control.

30 In the drilling of oil or gas wells by the rotary method, the bored hole or casing is kept full of a fluid, usually consisting of clay and water, and this so-called drilling mud is constantly circulated in the well during the drilling operation. When the drill pipe is removed from the hole (which is frequently necessary), the drilling mud displaces the removed drill pipe and consequently the level of this drilling mud in the well is lowered. Unless the workmen are extremely careful to turn the pump on at intervals and pump additional drilling mud into the casing to maintain a proper level, the drilling mud will be reduced to a point where the gas or oil pressure within the well will be sufficient to overcome the static pressure of the drilling pump, thus causing a blow-out. A blowing well is both dangerous and costly, and it is the purpose of my invention to automatically maintain a proper level of the drilling mud in the well at all times so that the danger of a blow-out is eliminated.

50 In the drawing, the numeral 1 indicates the surface casing or pipe, which extends downwardly into the bored hole. A suitable pump 2 picks up the drilling mud from the sump 3 and carries it into the swivel head 4, and thence downwardly into the casing. The pump 2 is usually driven

by an electric motor 5. All of this is usual and well-known, and the specific details of this arrangement form no part of my invention.

The level of the drilling mud must be maintained at approximately one hundred (100) feet, more or less, below the surface of the ground. At a suitable distance below the surface of the ground, I provide a pressure responsive element 6 in the casing 1, which comprises the following parts:

5 A housing 7, which is suitably attached to the casing 1 and is open to the interior of said casing—that is, the housing is either welded to or threaded into the side of the casing, substantially as shown. A diaphragm 8 is mounted in the housing 7 across the inner portion thereof, so that it is exposed to the drilling mud within the casing. The pressure of the drilling mud above the diaphragm 8 will therefore cause this diaphragm to flex inwardly, for purposes to be further described. A shaft 9 bears against, or is attached to the diaphragm 8, and this post is guided in brackets 10—11. A spring 12 bears against the bracket 10 and against the diaphragm 8, tending to urge this diaphragm outwardly and opposing the static pressure of the drilling mud in the casing. A pair of switch arms 13—14 are each pivotally mounted on a post 15—16. The inner ends of the switch arms 13—14 are engaged by the shaft 9, as shown in Figure 3. The outer ends of the switch arms 13—14 engage the contacts 17—18, respectively, whereby a circuit is closed through a wire or wires 19 to the surface, thereby starting the motor 5 and the pump 2 to force drilling mud into the casing.

35 A coil spring 20 bears against the housing 7 and against the switch arms 13—14, urging the switch arms into switch-closing position when the diaphragm 8 flexes outwardly under reduced drilling mud pressure in the casing. When a sufficient head of drilling mud has been pumped into the casing above the element 6, the diaphragm will be flexed inwardly, as shown in Figure 3, and the electrical circuit will be broken, thus stopping the pump 2. It will thus be evident that a proper head of drilling mud will be automatically maintained in the casing at all times.

Having described my invention, I claim:

1. An automatic pump control for wells, including a casing, a pump adapted to force drilling mud into the casing, and a motor driving said pump, of pressure responsive means in the casing, said pressure responsive means being positioned below the surface of the ground, and 55

means operable by said pressure responsive means, whereby said motor is started and stopped as the drilling mud actuates said pressure responsive means.

- 5 2. An automatic pump control for wells, including a casing, a pump adapted to pump drilling mud into the casing, and a motor driving said pump, of a pressure responsive element in the casing below the surface of the ground, a
10 diaphragm in said element, one side of said diaphragm being exposed to the drilling mud in the casing, and means operable by said diaphragm controlling said motor.

3. An automatic pump control for wells, including a casing, a pump adapted to pump drilling mud into the casing, and a motor driving said pump, of a pressure responsive element in the casing below the surface of the ground, a
15 diaphragm in said element, one side of said diaphragm being exposed to the drilling mud in the casing, and switch means in said element, said switch means being operable by said diaphragm, said switch means being adapted and
20 arranged to stop and start said motor.

4. An automatic pump control for wells, including a casing, a pump adapted to pump drilling mud into the casing, and a motor driving said pump, of a pressure responsive element in the casing below the surface of the ground, a diaphragm in said elements, one side of said diaphragm being exposed to the drilling mud in the casing, and switch means in the element, a post
25 extending from the diaphragm and engageable with the switch means, spring means urging the diaphragm outwardly against the pressure of the drilling mud, said switch means being adapted and arranged to stop and start the motor.

5. An automatic pump control for wells, including a casing, a pump adapted to pump drilling mud into the casing, and a motor driving said pump, of a pressure responsive element in the casing below the surface of the ground, a
30 diaphragm in said element, one side of said diaphragm being exposed to the drilling mud in the casing, and switch means in the element, a post extending from the diaphragm and engageable with the switch means, spring means urging the diaphragm outwardly against the pressure of the drilling mud, said switch means being adapted and arranged to stop and start the motor.

phragm being exposed to the drilling mud in the casing, a shaft operable by said diaphragm, said shaft being slidably mounted in the element, a switch mounted in the element, said switch being engaged by the shaft and adapted to move said switch into open and closed position, and spring means bearing against the switch adapted to move the same into closed position, and a conduit extending from the switch to the motor, whereby the motor is started and stopped.

6. An automatic pump control for wells, including a casing, a pump adapted to pump drilling mud into the casing, and a motor operating said pump, of a housing mounted in the casing below the surface, a diaphragm in the housing, one side of the diaphragm being exposed to the drilling mud in the casing, a shaft engageable by the diaphragm, means slidably mounting the shaft in the housing, switch means in the housing, said shaft engaging the switch means and adapted to operate the same, spring means in the housing opposing the pressure of the drilling mud in the casing, and a conduit extending from the switch means to the motor, whereby the motor is started and stopped.

7. A fluid level controller for wells, comprising means positioned in the well responsive to the fluid level in the well, and operable thereby, and a second means on the surface controlled by the first-named means whereby fluid may be added to the well to maintain a substantially constant fluid level.

8. A fluid level controller for wells, including a means adapted to force fluid into the well and a means actuating said first-named means of a fluid operable member in the well below the surface of the ground, said member being responsive to and operable by the fluid level in the well, said member being operatively connected to the second-named means whereby additional fluid is added to the well on operation of said member within the well.

JOHN S. PAGE.