Sept. 24, 1940. A. G. MILLER 2,215,558

DEEP WELL PUMP

Filed Dec. 29, 1938 2 Sheets-Sheet 1

FIG. 1

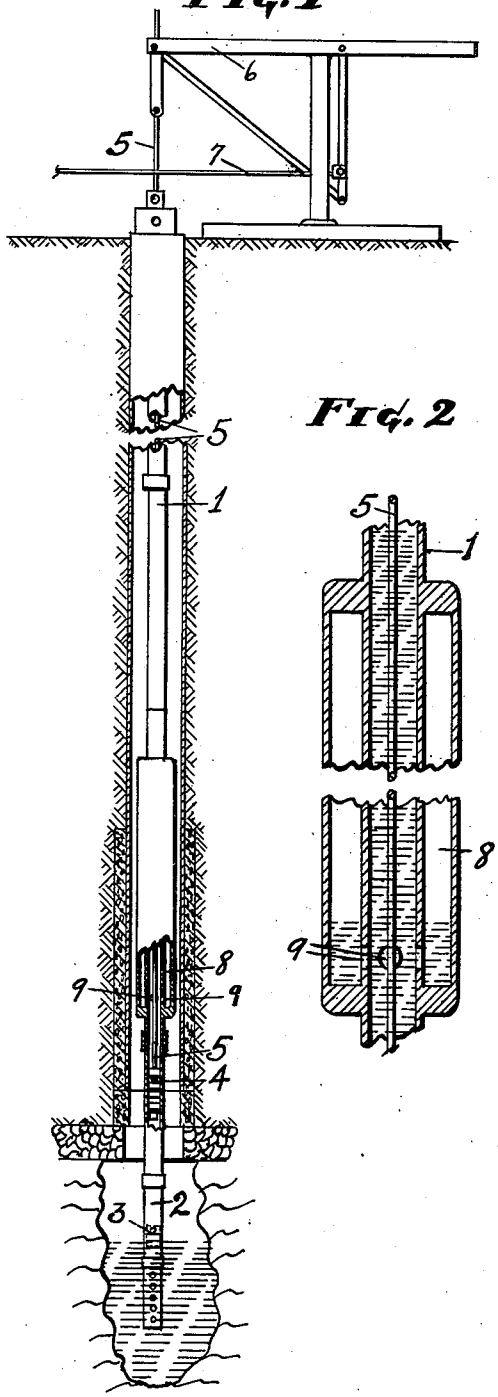


FIG. 2

FIG. 3

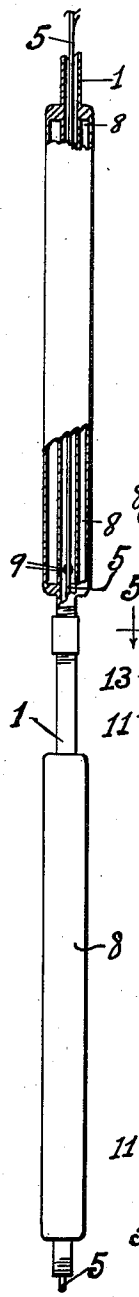


FIG. 4

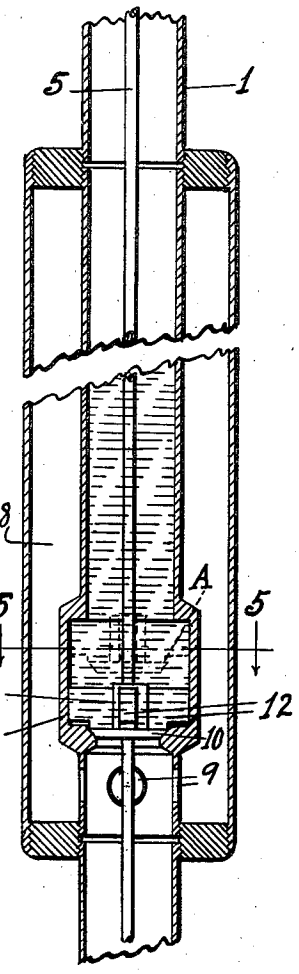
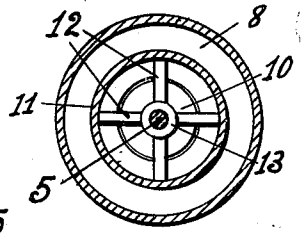


FIG. 5



INVENTOR.
ALFRED G. MILLER
BY E. G. Charles
ATTORNEY.

Sept. 24, 1940. A. G. MILLER 2,215,558

DEEP WELL PUMP

Filed Dec. 29, 1938 2 Sheets-Sheet 2

FIG. 6

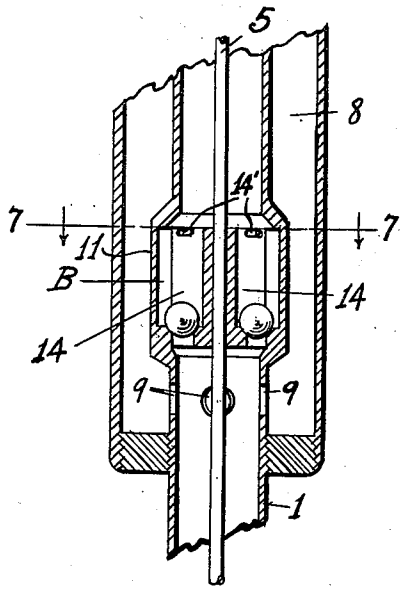


FIG. 8

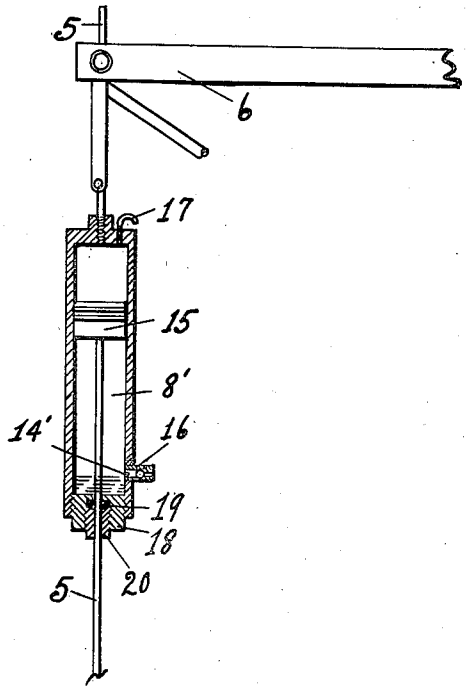


FIG. 7

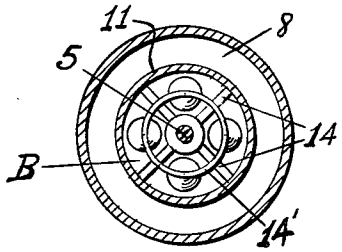
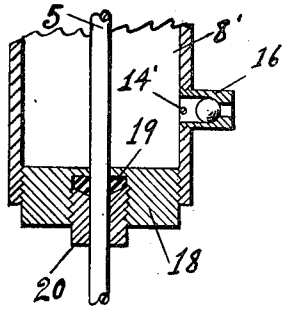


FIG. 9



INVENTOR.
ALFRED G. MILLER
BY U. G. Charles
ATTORNEY.

Patented Sept. 24, 1940 2,215,558

UNITED STATES PATENT OFFICE

2,215,558

DEEP WELL PUMP

Alfred G. Miller, Galva, Kans., assignor of one-half to Raymond Gillott, Wichita, Kans.

Application December 29, 1938, Serial No. 248,226

2 Claims. (Cl. 103—224)

My invention relates to a deep well pump, and has for its principal object a compression chamber as a shock absorber for the upward stroke of the pump, such as commonly employed in oil well pumping service.

A further object of my invention is to provide, at the bottom of the oil well, a compression chamber that will yield at each stroke of the pump to gradually hoist the column of oil extending from the bottom of the well to its upper extremity or place of discharge, the said chamber to assist for a continuous flow of the oil during pulsative strokes of the pump.

A still further object of my invention is to provide a pneumatic system, unitarily arranged and spaced along the oil conductor tube from the bottom thereof upward, as may be required for the depth of the well, the units coacting under the impact of the column load and stroke of the pump simultaneously.

A still further object of my invention is to provide a check valve means in the pump conductor casing whereby the column load will be carried to release compression which would otherwise be imposed in the compression chamber or chambers as the case may be.

A still further object of my invention is to arrange a compression chamber carried by the pump rod above the discharge line of the oil to function as a cushion at the first impulse of the pump to avoid a sudden pick-up of the load.

These and other objects will hereinafter be more fully explained, reference being had to the accompanying drawings, forming a part of this specification, and in which like characters will apply to like parts in the different views.

Referring to the drawings:

Fig. 1 is an elevation of an oil well pump equipment, illustrating a proposed position of compression chambers, parts removed for convenience of illustration.

Fig. 2 is an enlarged fragmentary sectional view of the compression chamber.

Fig. 3 is an elevation, showing an approximate position of the compression chambers on the pump line.

Fig. 4 is a modification showing a valve that is associated with the compression chamber.

Fig. 5 is a sectional view taken on line 5—5 in Fig. 4, looking in the direction of the arrows.

Fig. 6 is a similar modification to that shown in Fig. 4, the valve varying in its construction.

Fig. 7 is a sectional view taken on line 7—7 in Fig. 6.

Fig. 8 is an illustration showing the compression chamber carried by the pump rod adjacent the mule head of the pump jack.

Fig. 9 is an enlarged sectional drawing of the valve as applied to the compression chamber illustrated in Fig. 8.

The invention herein disclosed consists of a tube 1, functioning as a conductor for oil as pumped from the well. The said tube extends from the surface downward in contact with the oil sand or pool of oil, the lower end of which is equipped with a typical pumping equipment, consisting of a cylinder 2, having a check valve 3, shown by dotted lines, and plunger 4, the plunger being equipped with a cage, to which the pump rod 5 is connected, said rod extending upward to be engaged by a suitable pump jack, one of which is illustrated as at 6, the jack being operated by a surface rod, 7, as reciprocating means for the pump. The method thus disclosed has reference to the usual way by which oil is pumped from a deep well, in which case the tube as a conductor for the oil is of great length, and being filled with the oil in the course of pumping, affords an intense resistance to the upper stroke of the pump. In other words, the weight imposed thereby must move instantly as the plunger starts upward, the result of which is a great strain upon the pump rod and operating means therefor. To overcome this difficulty, I have provided and placed on the tube in close relation to the cylinder of the pump a compression chamber 8, consisting of a tubular element greater in diameter than that of the tube, and extending therealong. The upper end of said tubular element is secured air tight to the tube, and likewise the lower end thereof, by which means a compression chamber is formed, functioning as a shock absorber.

Positioned in the tube adjacent the lower end of the said compression chamber is a plurality of apertures 9, as communicating means between said tube and the cavity of the compression chamber, whereby the oil as pumped is free to flow through the apertures in its ascent to the surface. The oil thus introduced in said compression chamber is sealing means for the air contained therein, and by further injection, the air is compressed according to the force imposed therein, said force being actuated as a result of the long column of oil extending upward through the tubing, and in conjunction with the stroke of the pump, whereby a cushion is provided for each stroke as the oil is pumped, eliminating a dead load at the first impulse of the pumping mechanism.

In Fig. 1 is shown a single compression chamber applied to the tube as above described. To avoid excess length that may be required, I have provided a series of such compression chambers spaced along the tube, each of which have a similar connection to the tube. Consequently, the cushion effect is increased according to the depth of the well and the length of the pump stroke.

Being so arranged, a continuous flow of the oil discharge may occur, whereby pulsative movement is largely eliminated. In Figs. 4 and

5 is shown a modified way of supporting the column of oil in the tube that is maintained by the pump action as it flows continuously through a pipe line as conducting means to place of storage. The said means consists of a valve 10 seated in a pitting 11, functioning as a coupling for the tube, the valve to function as a check for the oil as forced therethrough, and the said valve has a plurality of wings 12, radially extending from a hub 13 that is axially bored, and through which the said pump rod will engage with a smooth running fit sufficient to render it practically oil tight, and the said wings are adapted to slideably engage on the wall of the fitting as it moves longitudinally therein, the extreme upward position of which is shown by dotted lines A, by which means the column of oil is maintained for a repeated stroke of the pump, the weight of the column not being imposed upon the compression chamber, the result of which may provide a greater elasticity of the compression chamber than it would otherwise, and a similar valve equipment may be applied in working relation to each succeeding chamber along the tube at the discretion of the manufacturer or oil field operator. A further modification with respect to the construction of the valve is illustrated in Fig. 6, in which case the fitting is equipped with an annular chamber B that is subdivided by a plurality of partitions 14, vertically positioned therein, and in which are ball valve equipments, as shown in Fig. 7, the said ball valves functioning as a check for the oil as forced therethrough.

To retain the said balls in their respective receptors of the fitting, there is provided an annular member 14' medially crossing each chamber, and being secured to the upper edge of the said partitions. Being so arranged, it will not encumber a free flow of oil therefrom, but retain the balls in operative position. In Fig. 8 is shown the application of the compression chamber in connection with the pump rod, and being carried thereby in close proximity to the mule head of the pump jack, in which case a piston 15 is secured to the upper end of said rod, and free to move reciprocatingly in its respective compression chamber 8' as the load may impose, the said chamber being substantially air tight, and provided at its lower extremity with an intake valve 16, by which means, when the piston is moved upward as the result of a maximum downward stroke, the deficiency as a result of possible leakage is supplied. There is also arranged at the upper extremity of said compression chamber a breather tube 17, through which air will eject and inject as a result of reciprocating movement of the piston.

As an air tight means for the rod where it leaves the compression chamber, there is provided a stuffing box consisting of a plug 18, threadedly engaging in the lower end of said chamber, and being axial therewith. The said plug is bored to receive the rod at its inner end, while the outer end is axially bored to receive a packing 19 that is compressed by a gland nut 20, threadedly engaging in the last said bore of the plug. There is also placed within said chamber a small quantity of heavy oil as lubricating and air tight sealing means for the rod in its reciprocating movement.

While I have shown and described compression chambers specifically, and also certain valve construction, I do not wish to be so restricted, as the same may be modified so long as their function remains the same, and furthermore, while I have shown a series of compression chambers spaced along the rod, each of which has communicating apertures with the tube, and such apertures may be eliminated, except in the lower chamber, in which case the succeeding chambers may be connected by tubular studs or apertured heads of the chambers when said heads are connected air tight, and such other modification may be employed as lie within the scope of the appended claims.

Having fully described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a deep well pump, a tubular pump conductor having a cylinder at the lower end thereof, and a check valve operatively positioned in the cylinder, a pump rod and plunger within the tubular conductor, power means to reciprocate said rod and its plunger as elevating means for oil in said tubular conductor, a tubular element greater in diameter than the tubular conductor through which the latter axially extends, each end of said tubular element being closed air tight by a head, the heads axially bored to engage said tubular conductor air tight, whereby a compression chamber is formed near the lower end of said tubular conductor, and the said conductor being apertured to communicate with the compression chamber adjacent the lower end thereof, a coupler for the ends of the tubular conductor within the compression chamber and being in close proximity to the apertures, a check valve having a hollow stem and axially seated in the coupler so that the pump rod will slidably engage through the stem with substantially fluid tight running fit, wings integrally joined and radially extending from the valve stem to slidably engage the wall of the coupler whereby the oil in the tubular conductor is carried upward from said valve while an added charge of oil is being raised by the plunger while the air in said compression chamber will function as a cushion at the moment of impact.

2. In a deep well pump, a tubular pump conductor, a check valve and plunger cylinder secured to the lower extremity of the tubular pump conductor, a pump rod extending through the tubular pump conductor to near its lower extremity to where it joins the cylinder, the rod having a plunger secured to its lower end, and means to reciprocatingly move the rod longitudinally whereby oil is elevated through the tubular conductor, a compression chamber surrounding the said conductor and spaced a short distance from the lower end thereof, means to seal both ends of the compression chamber air tight, and at the points where the said conductor extends through the sealing means, the said conductor being apertured adjacent the lower end of said compression chamber and communicating with the interior of said compression chamber whereby oil will enter as elevated to form a cushion, pulsating with the plunger movement and gradually taking the load at the instant of impact, a check valve structure positioned in the tubular conductor adjacent the apertures as carrying means for oil in said conductor above said valve whereby compression is relieved in the compression chamber to insure flexibility in the compression chamber at each succeeding stroke of the plunger, all as and for the purpose specified.

ALFRED G. MILLER.