Oct. 20, 1942. C. L. EVANS 2,299,315

PUMP

Filed March 5, 1940 3 Sheets-Sheet 1

Fig. 1.

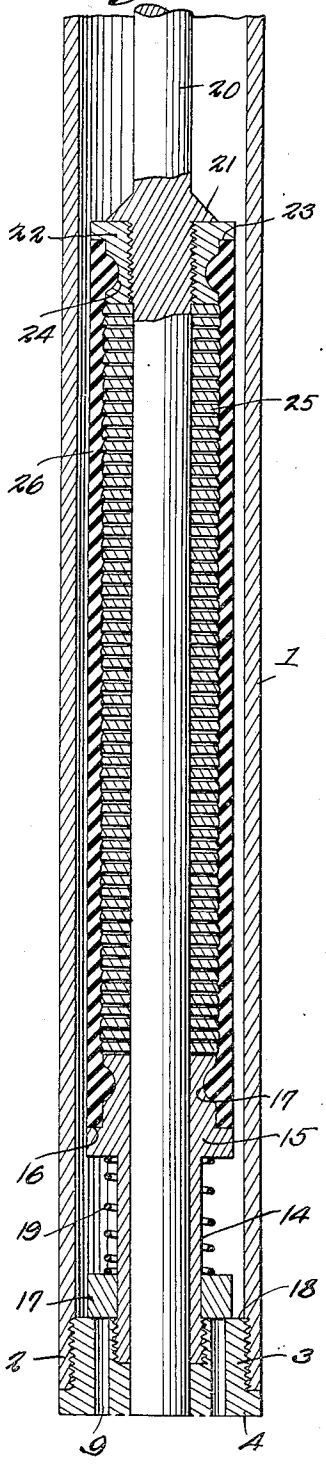


Fig. 1a.

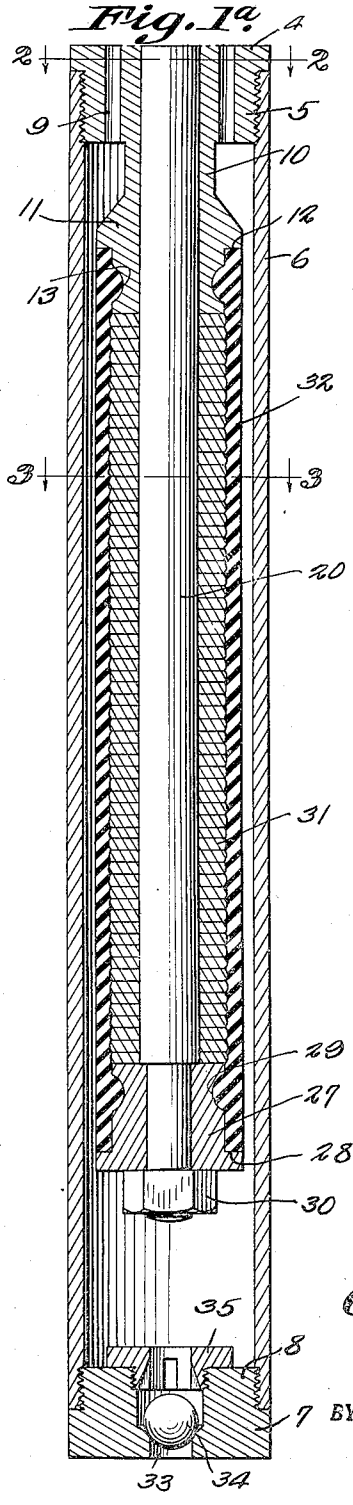


Fig. 2.

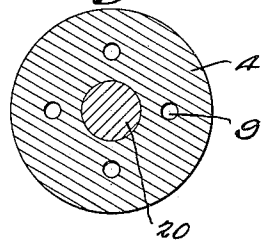
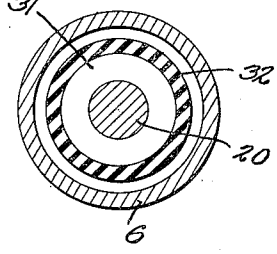


Fig. 3.



C. L. Evans
INVENTOR.

BY Albert Lee.
ATTORNEYS.

Oct. 20, 1942. C. L. EVANS 2,299,315

PUMP

Filed March 5, 1940 3 Sheets-Sheet 2

Fig. 4.

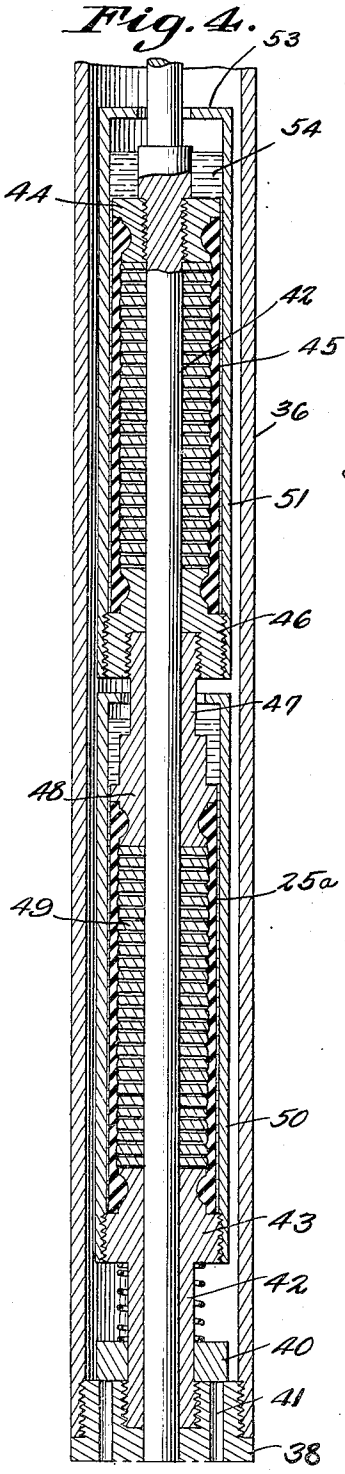


Fig. 4a.

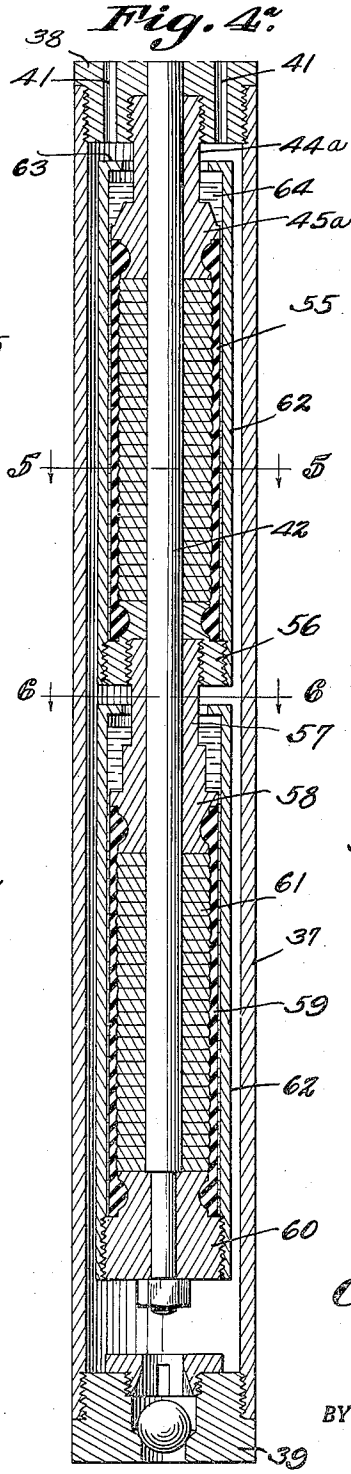


Fig. 5.

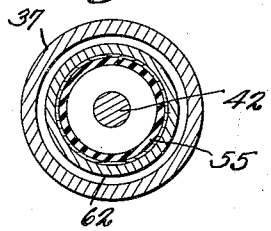
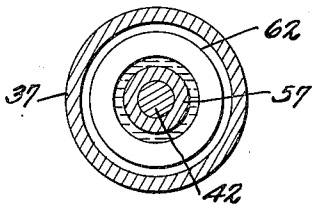


Fig. 6.



C. L. Evans

INVENTOR.

BY C. L. Evans.

ATTORNEYS.

Oct. 20, 1942. C. L. EVANS 2,299,315

PUMP

Filed March 5, 1940 3 Sheets-Sheet 3

Fig. 7.

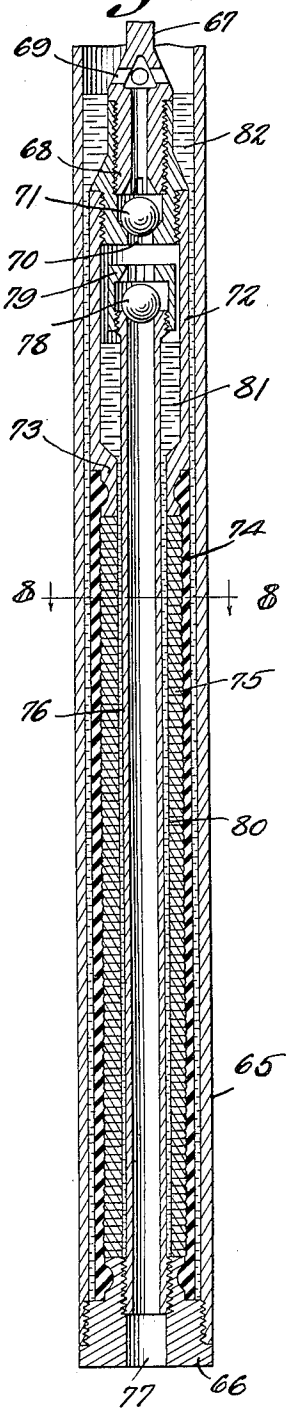


Fig. 8.

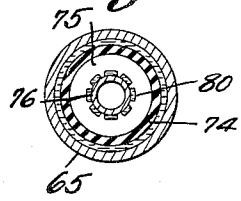
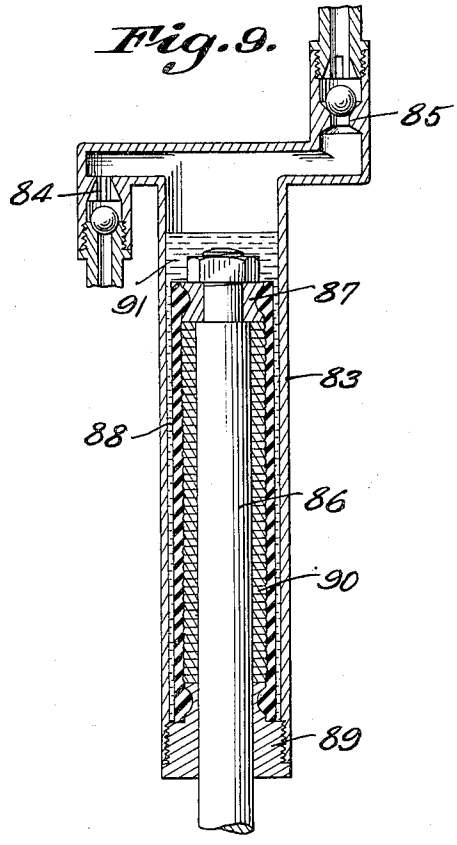


Fig. 9.



C. L. Evans

INVENTOR.

BY C. A. Snow & Co.

ATTORNEYS.

Patented Oct. 20, 1942 2,299,315

UNITED STATES PATENT OFFICE

2,299,315

PUMP

Carroll L. Evans, Tipton, Calif.

Application March 5, 1940, Serial No. 322,393

3 Claims. (Cl. 103—148)

This invention relates to pumps designed primarily for use in connection with deep wells.

An object of the invention is to provide the pump with a new and novel form of elastic seal so constructed that the elastic material of the seal will be protected from abrasion and from the action of deteriorating fluids.

With the foregoing and other objects in view which will appear as the description proceeds, the invention consists of certain novel details of construction and combination of parts hereinafter more fully described and pointed out in the claims, it being understood that changes may be made in the construction and arrangement of parts without departing from the spirit of the invention as claimed.

In the accompanying drawings the preferred form of the invention has been shown.

In said drawings:

Figure 1 is a central vertical section through the upper portion of a pump embodying the present improvement.

Figure 1*a* is a similar view through the lower portion of the pump.

Figure 2 is a section on line 2—2, Figure 1*a*.

Figure 3 is a section on line 3—3, Figure 1*a*.

Figure 4 is a central vertical section through the upper portion of another form of pump.

Figure 4*a* is a similar view taken through the lower portion of said pump.

Figure 5 is a section on line 5—5, Figure 4*a*.

Figure 6 is a section on line 6—6, Figure 4*a*.

Figure 7 is a central vertical section through another modification of the pump.

Figure 8 is a section on line 8—8, Figure 7.

Figure 9 is a section through another form of pump having the present improvement.

Referring to the figures by characters of reference 1 designates the upper pump cylinder having an interiorly screw-threaded lower end 2 which detachably engages the reduced threaded upper portion 3 of a connector 4. The lower portion of this connector is also reduced and screw-threaded as at 5 and is engaged by the lower cylinder 6 of the pump. The lower end of cylinder 6 is closed by a bottom cap 7 having a screw-threaded reduced portion 8 detachably seated in the cylinder.

Discharge ports 9 are extended through the connector 4 and extending downwardly from the connector between these ports is a tubular stem 10 provided with a stationary head 11 the lower portion of which is reduced in diameter to provide an annular shoulder 12. This reduced portion is also formed with an annular groove 13. Detachably connected to and extending upwardly from the connector 4 is another tubular stem 14 having a head 15 the upper portion of which is reduced in diameter to provide an annular shoulder 16 and this reduced portion is also formed with an annular groove 15. A valve in the form of a disc or ring 17 is slidably mounted on the stem 14 and is held normally pressed against the seat 18 formed by the upper surface of connector 4 so as normally to close the upper ends of the port 9. A coiled spring 19 is mounted on stem 14 and thrust upwardly against head 15 and downwardly against the valve 17. Thus the valve is held yieldingly to its seat.

A plunger rod has been indicated at 20 and is mounted to reciprocate within connector 4, stems 10 and 14, and heads 11 and 15. An annular shoulder 21 is provided on the rod 20 within cylinder 1 and constitutes an abutment for a plunger head 22 which is screwed onto the rod 20 and against the flange and is provided with an annular shoulder 23 and an annular groove 24.

The space between head 15 and plunger head 20 is normally closed by a series of contacting washers 25 which are mounted for movement relative to the rod 20 surrounded thereby and these washers, which have rounded outer edges, are in turn engaged by an elastic sleeve 26 which is molded about the washers and also about the reduced portions of the heads 15 and 20 so as to abut against the shoulders 16 and 23 and fit within the grooves 17 and 24. The external diameter of the sleeve is less than the internal diameter of cylinder 1 in which it is located so that fluid is thus free to flow upwardly within the cylinder and past the sleeve.

That portion of the rod 20 within the lower cylinder 6 is provided at its lower end with a lower plunger head 27 having an annular shoulder 28 and an annular groove 29. This head is held to the rod 20 by means of a nut 30 or the like so that it will move with the rod. A series of washers 31 is mounted loosely on the rod and normally fills the space between head 27 and head 11. These washers, which have rounded edges, are surrounded by an elastic sleeve 32 which is molded on the washers and also around the heads 27 and 11 so as to fit snugly against the shoulders 28 and 12 and within the grooves 29 and 13.

The bottom cap 7 has an intake port 33 normally closed by a suction valve 34 which can be in the form of a ball held against displacement by a retaining ring 35 detachably engaging the cap and overlying a portion of the valve.

When the rod 20 is moved upwardly to the position shown in Figures 1 and 1a the valve 34 is unseated so that fluid can flow into the cylinder 6. When rod 20 is moved downwardly the liquid in the cylinder 6 is stopped against downward flow therefrom and is displaced upwardly by the descending head 27. During this movement the sleeve 32 will stretch but the washers to which the sleeve is molded will act as spacers as they are moved apart, thereby preventing the sleeve from collapsing. At the same time the washers which have been held spaced by the upper sleeve 26 when the rod was moved upwardly, will move together. The descent of the plunger head 27 causes the displaced liquid to rise within the cylinder 6 and flow upwardly through ports 9 into the upper cylinder 1, this action causing valve 17 to unseat. As soon as the upward stroke is completed valve 17 will reseat so that the raised liquid will be trapped in cylinder 1. Consequently when additional charges of liquid are subsequently forced successively into cylinder 1, said cylinder will overflow and the liquid passed from the outlet provided at the upper end thereof.

For the purpose of protecting the elastic sleeve from abrasion and from the action of deteriorating fluid, the pump may be constructed as shown in Figures 4 to 6 inclusive. In this modified structuce the pump is made up of upper and lower cylinders 36 and 37 joined by connector 38 similar to connector 4 and provided also with a valve cap 39 at the bottom of the pump. In this modified structure a spring-pressed valve 40 normally closes ports 41 in the connector and the plunger 42 is slidable within a stem 42 extending upwardly from connector 38 and having a head 43. Another stem 44 is extended downwardly from the connector and has a head 45.

Instead of mounting a single elastic sleeve on that portion of the rod within the upper cylinder 42, an upper plunger head 44 is secured to the rod and has one end of an elastic sleeve 45 molded therearound and also around an intermediate head 46 in which the rod 42 is slidably mounted. This intermediate head 46, in turn, is secured to a stem 47 extending upwardly from a lower intermediate head 48 and an elastic sleeve 25a is molded at its upper end about the lower end of intermediate head 48 and, at its lower end about the head 43. Washers 49 are located within the respective sleeves and on the rod, these sleeves being molded about the washers in such a manner that the sleeves can expand and contract and at the same time be held against collapse by the washers.

For protecting the two sleeves in the cylinder 36 there are provided jackets 50 and 51 secured at their lower ends to the heads 43 and 46 respectively. These jackets are placed around but are spaced from the respective elastic sleeves and project upwardly therebeyond, there being an inturned flange 53 at the upper end of each jacket and constituting a baffle or retainer. Not only is each jacket spaced from the elastic sleeve therein but it is also spaced from the cylinder 36 and the area between the jacket and the elastic sleeve is adapted to be filled with a heavy liquid indicated generally at 54. This liquid can partly fill the upper portion of the jacket as shown in Figure 4.

That portion of the rod 42 within the lower cylinder 37 is similarly equipped with heads, sleeves and jackets. An elastic sleeve 55 is molded about and extends downwardly from the head 45a and is also molded about and joined to an upper intermediate head 56. A tubular stem 57 is connected to this head 56 and is provided at its lower end with a head 58. This head, in turn, is connected by an elastic sleeve 59, to the lower plunger head 60 secured to the lower end of rod 42. Washers 61 are mounted on the rod within the respective elastic sleeves and serve to mold such sleeves against collapse during the operation of the pump.

Jackets 62 are secured at their lower ends to the heads 60 and 56 respectively and extend around and are spaced from the elastic sleeves 59 and 55 respectively. They are also spaced from the cylinder 37 and project upwardly above the elastic sleeves where they are formed with inturned flanges or baffles 63. The spaces between these jackets and the elastic sleeves are filled with heavy fluid indicated at 64.

Obviously the pump shown in Figures 4 to 6 will function in the same manner as the one shown in Figures 1 to 3 inclusive but it has the added advantage of providing a protecting jacket for each elastic sleeve, each jacket constituting a container for a heavy protecting liquid whereby injury to the elastic sleeves is prevented.

In the form shown in Figure 7 the pump includes a casing 65 having an intake cap or head 66 at its lower end. The pump rod 67 has a suitable valve casing 68 at its lower end provided with outlet ports 69 and with an intake 70. A valve 71 in this casing serves to close the intake ports during the up-stroke of the rod but to open it during the down stroke. To this valve casing is joined the upper end of a tubular plunger head 72. The lower end of this plunger head is reduced in diameter as at 73 and molded about it is the upper end of an elastic sleeve 74. This sleeve, which is spaced from casing 65, has its lower end molded about the reduced upper portion of the head 66. Spacing washers 75 are surrounded by the elastic sleeve 74 which is molded therearound and these washers are superposed about a suction tube 76. This tube extends from the intake ports 77 of head 66 upwardly into the head 72 where it is provided with a check valve 78 having a retaining cap 79. Notches or recesses are formed at the centers of the washers 75, as shown particularly at 80 in Figure 8 and these are adapted to be filled with heavy fluid indicated at 81. This fluid extends along the tube 76 and also within the space between the casing 65 and the sleeve 74. Obviously when the rod 67 is reciprocated, sleeve 74 will be alternately stretched and retracted. Each up stroke will set up a suction within the head 72 and each down stroke will result in upward displacement of the trapped fluid through the ports 69 and above the heavy fluid 82 which is located around the head 72 and between sleeve 74 and the casing 65. With a structure such as shown in Figure 7 the elastic sleeve is protected both on its inner and outer surfaces by the heavy fluid, the fluid 81 supplementing the washers 75 to resist collapse of the sleeve when stretched.

Another type of pump embodying the present improvement has been shown in Figure 9. In this structure a pump cylinder has been shown at 83 and has a valved intske port 84 and a valved outlet 85. The piston rod 86 is mounted for reciprocation in the cylinder and has a piston head 87 to which is molded one end of an elastic sleeve 88. The other end of the sleeve is molded to the cylinder head 89 and washers 90 are mounted on rod 86 and within the sleeve so as to hold the sleeve against collapse. This sleeve is surrounded

by a protecting body of heavy fluid indicated at 91 and this fluid can extend upwardly above the piston head 87 as shown.

What is claimed is:

1. In a pump the combination with a cylinder having a valved inlet and a valved outlet, of an expansible, sealed plunger in the cylinder comprising a rod mounted for reciprocation in the cylinder, a plunger head carried by the rod, an imperforate elastic sleeve secured at one end to the plunger head and anchored at its other end to the cylinder, thereby to provide a sealed casing and a series of spacing washers movably engaging and centered by the rod and surrounded by and joined to the sleeve, said washers normally contacting and cooperating to fill the sleeve when in normal position.

2. In a pump the combination with a cylinder having a valved inlet and a valved outlet, of an extensible sealed plunger in the cylinder comprising a head, an imperforate elastic sleeve secured at one end to and closed by the head, the other end of the sleeve being closed and anchored to the cylinder, a series of normally contacting spacing washers surrounded by and joined to the sleeve, said series being proportioned to normally fill the sleeve, a heavy protecting fluid extending around the sleeve and outside of the path of fluid when directed from the inlet to the outlet, and a rod secured to the head and slidable in the washers and the anchored end of the sleeve, said rod constituting means for holding the washers centered and alined and means to reciprocate the plunger.

3. A pump including a cylinder having a valved inlet at one end, a plunger rod, a plunger head on the rod and mounted to reciprocate therewith, a stationary head in the cylinder, a sealed elastic sleeve connecting said heads, and normally contacting relatively movable washers surrounded by and connected to the sleeve, said washers normally filling the sleeve and being movably mounted on and centered by the rod.

CARROLL L. EVANS.