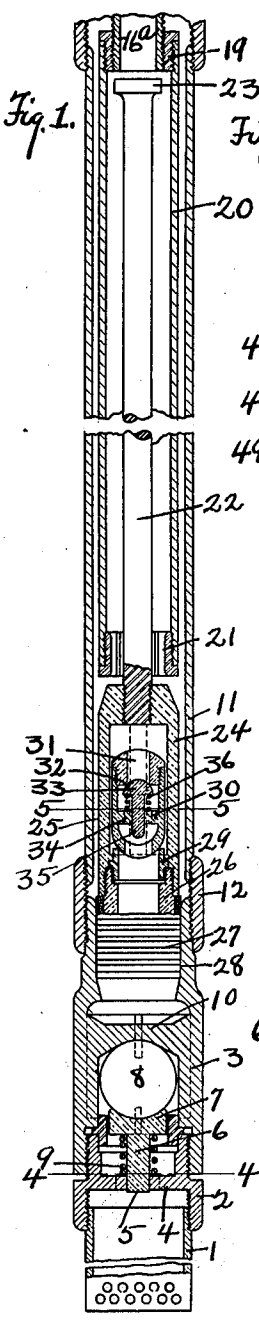
R. CONRADER.

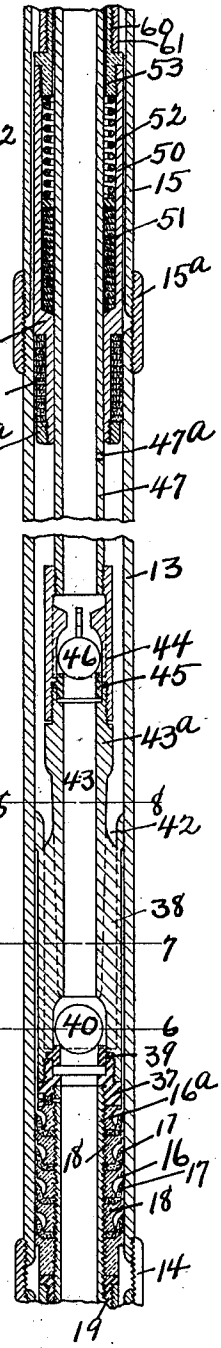
PUMP.

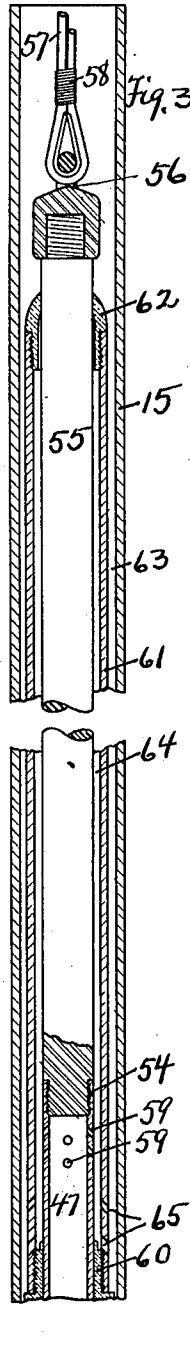
APPLICATION FILED MAY 23, 1908.

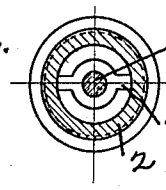
1,031,248.

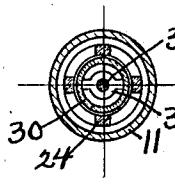
Patented July 2, 1912.

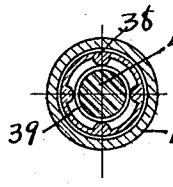


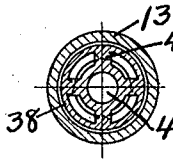


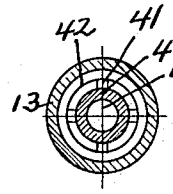












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UNITED STATES PATENT OFFICE.

RUDOLPH CONRADER, OF ERIE, PENNSYLVANIA.

PUMP.

1,031,248. Specification of Letters Patent. Patented July 2, 1912.

Application filed May 23, 1908. Serial No. 434,502.

To all whom it may concern.

Be it known that I, RUDOLPH CONRADER, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented new and useful Improvements in Pumps, of which the following is a specification.

This invention relates to pumps, and consists in certain improvements in the construction thereof as will be hereinafter fully described and pointed out in the claims.

The invention is particularly adapted to pumps for deep wells. In pumps of this character, the lost motion between the pump plunger and reciprocating device at the top of the well is often so great as to nearly dissipate the entire movement of the actuating device, so that practically no movement is given to the plunger. This difficulty is peculiarly present where a cable is used as the connection between the plunger and the reciprocating device at the top of the well. In any event in deep wells, the weight of the plunger and attached parts must be depended on to compel the downward stroke of the plunger.

One of the objects of the invention is to provide means whereby the plunger is subjected to pressure on its downward stroke as well as the upward stroke, so that the sucker rod or cable is under strain at all times, and in consequence the full movement of the reciprocating device at the top of the well is delivered to the plunger.

Further objects of the invention are to prevent the accumulation of sand on the working parts, and other details which will appear more fully in the description and claims.

The invention is illustrated in the accompanying drawings as follows:

Figure 1 is a central section of the pumping apparatus at the bottom of the pump. Fig. 2 is a similar section of the parts immediately above those of Fig. 1. Fig. 3 is a similar section of the parts immediately above those parts shown in Fig. 2. Fig. 4 is a section on the line 4—4 in Fig. 1. Fig. 5 is a section on the line 5—5 in Fig. 1. Fig. 6 is a section on the line 6—6 in Fig. 2. Fig. 7 a section on the line 7—7 in Fig. 2. Fig. 8 a section on the line 8—8 in Fig. 2.

1 marks the usual strainer at the bottom of the well. The fitting 2 is secured to this strainer being exteriorly threaded at the top. A valve crown 3 is screwed onto the upper part of the fitting 2. The fitting 2 has a spider 4 which forms a guide for a stem 6 of a valve lifter 7. The valve lifter contacts the ball 8, and through the influence of the spring 9 tensioned between the spider 4 and lifter 7 maintains the ball normally in an open position in the cage or crown 3, the crown being provided with the usual spider 10 at the top. An extension 11 to the working barrel is connected with the valve crown 3 by a coupling 12. The working barrel 13 is connected with the extension 11 by a coupling 14. The usual tubing 15 is connected with the working barrel by a coupling 15ª. The tubing in the exemplification of the invention shown forms the lift passage.

The plunger 16 is made up with the cups 17 which are secured on a sleeve 16ª by the nuts 18. The lower nut is locked in position by a jam nut 19 which is exteriorly threaded, and a plunger extension 20 is screwed onto these exterior threads. A spider or shoulder 21 is arranged within the extension 20 and is adapted to engage a shoulder 23 on a pin 22. The pin telescopes the extension 20 and is of sufficient length to permit the reciprocation of the plunger and the extension without bringing the shoulder 21 into engagement with the shoulder 23. The pin 22 is screwed into the cage 24 of the standing valve 25. The cage is exteriorly screw threaded at the bottom, and has the extension 26 secured thereto on which is arranged the packing rings 27. These packing rings form a joint or closure with the beveled opening 28 of the auxiliary check valve having the cage 3. A seat 29 is secured between the cage 24 and extension 26 as they are assembled, and the valve 30 operates upon this seat. The valve 30 has an opening 31 through it. A valve seat 32 is arranged around this opening, and is operated upon by the relief valve 33. A spider 34 is arranged in the valve 30 and forms a guide for the stem 35 of the valve 33. A spring 36 is tensioned between the valve 33 and the spider 34 and keeps the valve normally closed. The purpose of this relief valve will be hereinafter explained.

The upper nut 37 on the plunger is exteriorly screw threaded and a combined sand trap and valve crown 38 is screwed onto this nut, thus forming a connection with the plunger. A valve seat 39 is secured between the crown and nut as they are assembled, and valve ball 40 operates in the crown and

prevents a retrograde movement through the plunger. The trap is made up with a series of webs 41 (see Figs. 7 and 8) and a bowl 42. The upper part of the cup of the sand trap forms a sliding fit with the working barrel, so that any particles of sand that may be precipitated from the liquid above the trap are caught by the trap deflected toward the outlet of the trap, thus protecting the cups 17. A central passage 43 extends upwardly from the bottom of the trap cup and the top of the crown and forms the discharge opening. A connection 43[a] is arranged at the upper end of the passage 43 and a cage 44 is screwed onto this connection, a seat 45 being secured between them. A valve ball 46 is arranged in the cage 44 and prevents a retrograde movement through the passage 43. A hollow plunger rod 47 is screwed into the cage 44 and extends up through a closure at the top of, or above the working surfaces of the barrel. This closure is formed of the fitting 48 on which are arranged packing rings 49, the packing rings being secured by the nut 49[a]. A stuffing box 50 is formed in the upper part of the fitting 48 and packing 51 is arranged in this stuffing box, and this packing is held under pressure by a spring 52. A nut 53 is screwed into the top of the fitting and forms a base for the spring. The upper end of the tube or plunger rod 47 is internally screw threaded and a solid rod 55 is screwed into the tube 47 forming an extension thereof. An eye 56 is screwed onto the end of the rod 55 and a cable 57 is secured to the eye by the fastening 58. Openings 59 are provided in the tube or rod 47 for the discharge of liquid from the tube 47 to the well tubing above the closure 48.

In the operation of the pump, assuming that the plunger is in the lower position, upon the up stroke of the plunger, liquid is forced from the chamber formed between the plunger and the closure 48 through the cup 42 of the sand trap by way of the passage 43, valve 46, rod 47 and opening 59 to the tubing above the closure. On this upward stroke of the plunger the working barrel or extension of the working barrel below the plunger is filled with a new charge of liquid. On the down stroke of the plunger it will be observed that the plunger will be subjected to the lift pressure to the extent of the area of the rod or tube 47. As the pressure of the lift is very great in wells of this type, this pressure is sufficient to positively and immediately force the plunger down and to maintain a tension on the cable or rods connecting the plunger with the operating mechanism (not shown) at the top of the well. This effect of course is only possible, because the pressure of the lift is cut off by the closure 48 from the liquid passing below the plunger to above it, so that the only pressure opposing the weight of the plunger and the pressure incident to the lift on the rod 47 is a pressure necessary to lift the liquid from below the plunger to above it. This of course is insignificant when compared with the pressures encountered in the lift. On the down stroke of the plunger the valve 46 remains seated and the standing valve remains closed except as to the relief valve and the valve 40 of course is opened by the upward movement of liquid.

The operation above described is disturbed by the fact, that the rod 47 so reduces the capacity of the chamber above the plunger that it will not receive the liquid displaced by the plunger on the downward stroke. This disturbance of course is more pronounced as the size of the rod 47 is increased, and it is desirable to have this of sufficient size to allow of an adequate opening through it, and also to give sufficient area to deliver an effective pressure to the plunger. To obviate this difficulty, I have provided the relief valve 33. This relief valve is maintained in closed position normally by the spring 36. This spring is of sufficient strength to oppose an outward movement of the liquid past the valve 33 except at a pressure greater than is necessary to effect the lift of liquids from below to above the plunger. As before stated this pressure is very light, so that the spring is a comparatively light one. This relief valve, however, permits the free downward movement of the plunger, and permits of a discharge of liquid from below the plunger equal to the displacement of the plunger, thus preventing the blocking of the pump where full charges of liquid are being pumped. In order that this relief movement may not be interfered with by the auxiliary check 8, the valve lift is provided as heretofore described. When, however, the standing valve is lifted by the action of the shoulder 23 engaging with the shoulder 21 as the plunger is lifted, and the full column of liquid in the lift is released, the auxiliary check 8 is closed by the rush of liquid, thus preventing its violent discharge into the well. In order to prevent the trapping of gas immediately below the closure 48. I prefer to provide a vent 47[a] which at the bottom of the stroke is below the bottom of the closure, so as to permit of the escape of gas. On the initial movement of the rod 47 upwardly, this vent is closed by the closure 48.

In pumping deep wells when the pumping is stopped there remains in the tubing a column of liquid of great height in which there is ordinarily in suspension more or less sand, and this sand as the pumping ceases settles at the bottom of the tubing and seriously effects the rod 47 operating

through the closure. To prevent the action of this sand upon the rod, I have provided a sand trap at the bottom of the tubing. which is self cleaning, so that its capacity is renewed with each pumping. The nut 53 has an upward extension 60 on which a sand trap tube 61 is screwed. This tube is closed by a cap 62 which forms a sliding fit on the rod 55. A chamber 63 is formed between the trap tube 61 and the well tube 15 in which the sand is deposited and caught. A chamber 64 is also formed between the tube 47 and the trap tube 61, and the tube 47 is discharged through the opening 59 into the chamber 64. The tube 61 is of such length, that the openings 59 are at all times within the chamber 64. Openings 65 lead from the bottom of the chamber 64 to the chamber 63. These openings being preferably near the bottom of these chambers and slightly inclined downward to the chamber 63, sand in settling on the chamber 63 will not pass through these openings, and is thus kept out of contact with the rod 47. When the pumping is started, the sand in the trap is carried upwardly with the moving liquid and discharged with it, so that a receptacle with full capacity is left ready to receive the deposits from the column of liquid after the pumping is again stopped.

It is often desirable to reverse the current of liquid through the strainer, so as to prevent clogging at the strainer. In the present construction the discharge through the relief valve 33 accomplishes this purpose, as with each stroke there is discharged through this relief valve a current of liquid equal to the displacement of the plunger rod above the plunger.

Different devices may be utilized for compensating for the displacement of the plunger rod. Where the displacement by the plunger on its downward stroke of liquid below the plunger is greater than the chamber formed above the plunger, the excess must be permitted to escape. This, of course would be unnecessary if the displacement below the plunger were equal to the space or chamber formed above it. I do not wish to be understood therefore, that means permitting a discharge of liquid from below the plunger equal to the displacement of the plunger necessarily involves a greater displacement below the plunger than the chamber or space formed above it.

I do not claim broadly in this application, the combination of a working barrel; a plunger in the working barrel; a closure above the plunger; a rod extending through the closure; and means for draining the part above the closure into the working barrel below the closure with the plunger in its lower position as this subject matter broadly considered is disclosed and claimed by me in application #451,974, filed Sept. 8, 1908.

What I claim as new is:

1. In a pump, the combination of a working barrel; a closure above the barrel; a pump plunger in the barrel; a plunger rod secured to the plunger and extending through the closure; pipes forming a lift passage; valves controlling the movement of liquid causing the movement of the liquid from the pump barrel to the lift passage on the up stroke of the plunger, to seal the connection between the pump barrel and the lift passage on the down stroke of the plunger and to cause the movement of the liquid from below to above the plunger on the downward stroke of the plunger; and means for compensating for the displacement of the plunger rod on the downward stroke of the plunger.

2. In a pump, the combination of a working barrel, a closure above the barrel; a well tubing extending above the closure and forming the lift of the pump; a pump plunger in the barrel; a plunger rod secured to the plunger and extending through the closure; valves controlling the movement of the liquid from the pump barrel to the lift passage on the up stroke of the plunger, to seal the connection between the pump barrel and the lift passage on the down stroke of the plunger and to cause the movement of the liquid from below to above the plunger on the downward stroke of the plunger; and means for compensating for the displacement of the plunger rod on the downward stroke of the plunger.

3. In a pump, the combination of a working barrel; a closure above the barrel; a pump plunger in the barrel; a hollow plunger rod secured to the plunger and extending through the closure and forming a passage for the pumped liquid from below the closure to above the same; valves controlling the movement of liquid causing the movement of the liquid from the pump barrel to the lift passage on the up stroke of the plunger, to seal the connection between the pump barrel and the lift passage on the down stroke of the plunger, and to cause the movement of the liquid from below to above the plunger on the downward stroke of the plunger; and means for compensating for the displacement of the plunger rod on the downward stroke of the plunger.

4. In a pump, the combination of a working barrel; a plunger in the barrel; means for conveying lift pressure to the plunger to force it down; devices for cutting off the lift pressure from the liquid passing from one side of the plunger to the other during the downward movement of the plunger; and means permitting a discharge of liquid

from below the plunger equal to the displacement of the plunger.

5. In a pump, the combination of a working barrel; a closure above the barrel; a plunger in the barrel; a plunger rod secured to the plunger and extending through the closure; pipes forming a lift passage; valves controlling the movement of liquid causing the movement of the liquid from the pump barrel to the lift passage on the up stroke of the plunger, to seal the connection between the pump barrel and the lift passage on the down stroke of the plunger, and to cause the movement of the liquid from below to above the plunger on the downward stroke of the plunger; and means for compensating for the displacement of the plunger rod on the downward stroke of the plunger.

6. In a pump, the combination of a working barrel; a closure above the barrel; a plunger in the barrel; a plunger rod extending from the plunger through the closure, said rod being subjected to the lift pressure for forcing the plunger down, devices acting with said closure for cutting off the lift pressure from the liquid passing from one side of the plunger to the other during the downward movement of the plunger; and means permitting a discharge of liquid from below the plunger equal to the displacement of the plunger.

7. In a pump, the combination of a working barrel; a plunger in the barrel; a closure above the barrel; a hollow rod secured to the plunger and extending above the closure and having a passage therein for carrying the liquid through the closure; devices acting with the closure to prevent a return movement of liquid past the closure on the downward stroke of the plunger; and means permitting a discharge of liquid from below the plunger equal to the displacement of the plunger.

8. In a pump, the combination of a working barrel; a plunger in the barrel; a closure above the plunger, said plunger having a greater displacement in its downward movement than in its upward movement; valves for causing the movement of the liquid from the barrel through the closure on the up stroke of the plunger, and for sealing the barrel against the lift on the down stroke of the plunger, and to control the liquid to pass through the plunger on the downward movement of the plunger; and a relief valve for permitting the discharge of excess liquid displaced by the plunger on its downward movement.

9. In a pump, the combination of a working barrel; a plunger in the barrel; a closure above the plunger, said plunger having a greater displacement in its downward movement than in its upward movement; valves for causing the movement of the liquid from the barrel through the closure on the up stroke of the plunger, and for sealing the barrel against the lift on the down stroke of the plunger, and to control the liquid to pass through the plunger on the downward movement of the plunger; and a relief valve arranged below the plunger for permitting the discharge of any excess liquid on its downward movement.

10. In a pump, the combination of a working barrel; a closure above the barrel; a pump plunger in the barrel; a plunger rod secured to the plunger and extending through the closure; pipes forming a lift passage; valves controlling the movement of liquid causing the movement of the liquid from the pump barrel to the lift passage on the up stroke of the plunger, to seal the connection between the pump barrel and the lift passage on the down stroke of the plunger and to cause the movement of the liquid from below to above the plunger on the downward stroke of the plunger; and a relief valve for permitting a discharge of liquid in the downward stroke of the plunger to compensate for the displacement of the plunger rod above the plunger.

11. In a pump, the combination of a working barrel; a plunger in the barrel; means for conveying lift pressure to the plunger to force it down; devices for cutting off the lift pressure from the liquid passing from one side of the plunger to the other during the downward movement of the plunger; and a relief valve permitting a discharge of liquid displaced by the plunger in its downward stroke in excess of the capacity of the chamber formed above the plunger in the working barrel.

12. In a pump, the combination of a working barrel; a plunger in the barrel; means for conveying lift pressure to the plunger to force it down; devices for cutting off the lift pressure for the liquid passing the plunger, said plunger having greater displacement in its downward movement as the liquid passes it than the chamber formed by it; a standing valve at the bottom of the working barrel; and a relief valve arranged in the standing valve.

13. In a pump, the combination of a working barrel; a plunger in the working barrel; a lift passage leading from the barrel; a closure between the lift passage and the barrel; a plunger rod secured to the plunger and extending through the closure; valves controlling the movement of liquid causing the movement of the liquid from the pump barrel to the lift passage on the up stroke of the plunger, to seal the connection between the pump barrel and the lift passage on the down stroke of the plunger and to cause the movement of the liquid from below to above the plunger on the downward

stroke of the plunger; and a standing valve in the bottom of the pump barrel, and a relief valve in the standing valve.

14. In a pump, the combination of a working barrel; a plunger in the working barrel; a standing valve comprising a cage and check, the check having the opening through it and guide spider in it; a valve closing the opening in the check; and a spring normally holding the valve closed and tensioned between the valve and the spider.

15. In a pump, the combination of a working barrel; a plunger in the barrel; a closure above the plunger, a plunger rod extending from the plunger through the closure; a standing valve at the bottom of the plunger; a relief valve in the standing valve; an auxiliary check valve below the standing valve; and a valve lift normally holding the auxiliary check in an open position.

16. In a pump, the combination of a working barrel; a pump plunger in the working barrel; a closure above the plunger; a plunger rod secured to the plunger and extending through the plunger; a standing valve; a relief valve in the standing valve; the auxiliary check below the standing valve; the fitting 2 at the bottom of the auxiliary check; a valve lift having a stem 6 arranged to operate in the fitting; and a spring acting on the lift normally holding the auxiliary check in an open position.

17. In a pump, the combination of a working barrel; a plunger in the working barrel; a closure above the plunger; a plunger rod secured to the plunger and extending through the closure; and a sand trap above the plunger and below the closure.

18. In a pump, the combination of a working barrel; a plunger in the working barrel; a closure above the plunger; a plunger rod secured to the plunger and extending through the closure; and an open sand trap above the plunger and carried therewith, the top of the sand trap forming a sliding fit with the working barrel.

19. In a pump, the combination of a working barrel; a plunger in the working barrel; a closure above the plunger; a plunger rod secured to the plunger and extending through the closure; and an open top sand trap above the plunger and carried therewith, the top of the sand trap forming a sliding fit with the working barrel, and having a discharge opening in the bottom thereof through which the pumped liquid passes.

20. In a pump, the combination of a working barrel; a plunger in the working barrel; a closure above the plunger; a hollow rod extending through the closure and forming a passage for the pumped liquid through the closure; and an open top sand trap connected with the rod and having an opening at the bottom through which liquid is discharged to the rod.

21. In a pump, the combination of a working barrel; a plunger in the working barrel; and a combined sand trap and crown secured to the plunger comprising a crown for the plunger valve, a central passage, a surrounding cup and connecting webs 41.

22. In a pump, the combination of means for forcing liquid; a discharge passage for the forced liquid; and an open sand trap in the form of a cup through which said discharge passage leads, said sand trap having a central passage and webs connecting the walls of the cup with the central passage.

23. In a pump, the combination of a working barrel; a plunger in the barrel; a closure above the plunger; a hollow rod extending through the closure for operating the plunger; a plunger valve carried with the plunger; and a valve above the plunger valve and below the closure for preventing a retrograde movement of the liquid through the hollow rod; and means for permitting a discharge of liquid from below the plunger equal to the displacement of the plunger.

24. In a pump, the combination of a working barrel; a plunger in the barrel; a closure above the plunger; a hollow rod extending through the closure for operating the plunger; a plunger valve carried with the plunger; a valve above the plunger valve and below the closure for preventing a retrograde movement of the liquid through the hollow rod; means for permitting a discharge of liquid from below the plunger equal to the displacement of the plunger; and a sand trap arranged above the plunger and below the closure, and arranged in the path of the liquid.

25. In a pump, the combination of a working barrel; a plunger in the barrel; a closure above the plunger; a rod extending through the closure; an open top sand trap above the plunger and below the closure and carried with the plunger; and a relief valve for permitting the discharge of liquid to compensate for the displacement of the rod.

26. In a pump, the combination of a working barrel; a plunger in the barrel; a closure above the plunger; a rod extending through the closure and secured to the plunger; a sand trap comprising a tube extending upwardly from the closure and having a restricted opening for the rod; and a well tubing surrounding the sand trap tube and being of a size relatively to the sand trap tube to form a chamber between said trap tube and said well tubing.

27. In a pump, the combination of a working barrel; a plunger in the barrel; a

closure above the plunger; a rod extending through the closure and secured to the plunger; a sand trap comprising a tube extending upwardly from the closure and having a restricted opening for the rod; and a well tubing surrounding the sand trap and being of a size relatively to the sand trap tube to form a chamber between the trap tube and said well tubing, said sand trap tube being of a size to form a chamber between its walls and the rod.

28. In a pump, the combination of a working barrel; a plunger in the working barrel; a closure above the plunger; a rod extending through the closure and connected with the plunger; and a sand trap tube extending upwardly from the tube and forming a chamber surrounding the rod, said tube receiving the pumped liquid and having openings therein near the bottom thereof for the discharge of liquid.

29. In a pump, the combination of a working barrel; a plunger in the working barrel; a closure above the plunger; a hollow rod extending through the closure and connected with the plunger and forming the passage for liquid through the closure; and a sand trap tube extending upwardly along the rod and forming a chamber between its walls and the rod for the reception of liquids from the rod.

30. In a pump, the combination of a working barrel; a plunger in the working barrel; a closure above the plunger; a hollow rod extending through the closure and connected with the plunger and forming the passage for liquid through the closure; and a sand trap tube extending upwardly along the rod and forming a chamber between its walls and the rod for the reception of liquids from the rod, said tubing having openings at its bottom for the discharge of liquid received from the rod.

31. In a pump, the combination of a working barrel; a plunger in the working barrel; a closure above the plunger; a hollow rod extending through the closure and connected with the plunger and forming a passage for the liquid through the closure; a well tubing extending upwardly from the working barrel; and a sand trap tube extending upwardly from the closure and forming a chamber around the rod for the reception of liquid from the rod, said tube being of a size to form a chamber between the walls and the well tubing, and having an opening connecting it with the chamber within the well tubing.

32. In a pump, the combination of a working barrel; a plunger in the working barrel; a closure above the plunger, having a packed connection between it and the working barrel, and carrying a gland for the plunger rod; the plunger rod extending through said gland and closure and connected with the plunger; and a sand trap tube secured to the closure and extending upwardly along the rod forming a chamber between its walls and the rod.

33. In a pump, the combination of a working barrel; a plunger in the working barrel; a closure above the plunger; a hollow rod extending through the closure and connected with the plunger and forming a passage for the liquid through the closure; a sand trap tube extending from the closure upwardly; and forming a chamber around the hollow rod, said tube being the length equal to the stroke of the pump, and receiving the liquid pumped from the rod.

34. In a pump, the combination of a working barrel, a plunger in the barrel; a closure above the plunger forming a chamber between the plunger and closure through which the liquid pumped passes; a hollow rod for the passage of liquid extending through the closure and connected with the plunger; and a vent on the rod in position to be closed by the closure with the upward movement of the rod.

35. In a pump, the combination of a working barrel; a plunger in the barrel; lift passages connected with the working barrel; a closure between the lift passages and the working barrel; a plunger rod extending through the closure and secured to the plunger; valves controlling the movement of liquid causing the movement of the liquid from the pump barrel to the lift passage on the up stroke of the plunger, to seal the connection between the pump barrel and the lift passage on the down stroke of the plunger and to cause the movement of the liquid from below to above the plunger on the downward stroke of the plunger; and devices below the plunger for compensating for the displacement of the plunger rod.

36. In a pump, the combination of a working barrel; a plunger in the working barrel; means for filling the working barrel on the upward stroke of the plunger from below; a strainer below the working barrel; and means for discharging a limited amount of liquid to the strainer on the downward stroke of the plunger for the purpose described.

37. In a pump, the combination of a working barrel; a plunger in the working barrel; a closure above the plunger; a plunger rod extending through the closure and connected with the plunger; a strainer below the working barrel; means for permitting the filling of the working barrel on the upward stroke of the plunger; and means for discharging from the working barrel to the strainer a volume of liquid equal to the displacement of the rod on the downward stroke of the plunger.

38. In a pump, the combination of a

working barrel; a plunger in the barrel; a sand trap and valve cage forming a continuation of the plunger, and having a continuous opening along the top of its surrounding walls; a valve in the trap and cage; a sucker rod; and a web connecting the sucker rod with the walls of the sand trap and cage.

39. In a pump, the combination of a working barrel; a plunger in the barrel; a sand trap and valve cage forming a continuation of the plunger and with its wall in normal contact with the walls of the pump barrel, and having a continuous opening along the top of its surrounding walls; a valve in the trap and cage; a sucker rod; and a web connecting the sucker rod with the walls of the sand trap.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

RUDOLPH CONRADER.

Witnesses:
K. R. KANE,
J. J. SCHWARTZ.