R. CONRADER.

PUMP.

APPLICATION FILED APR. 24, 1905.

936,605.

Patented Oct. 12, 1909.

2 SHEETS—SHEET 1.

Fig 1

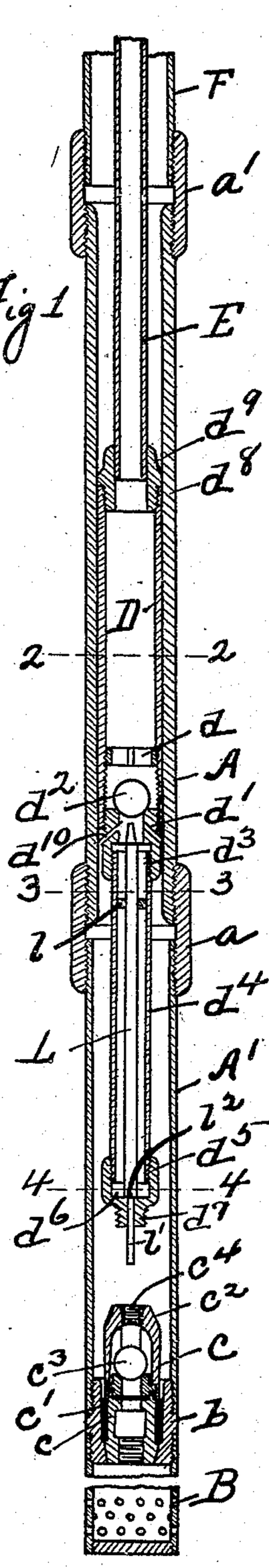


Fig. 2.

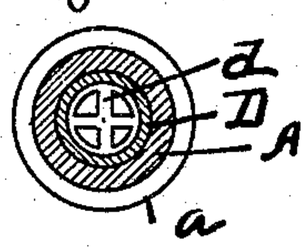


Fig. 3.

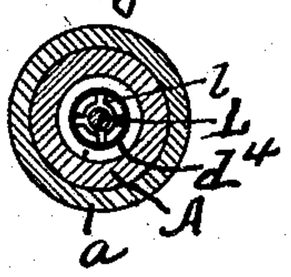
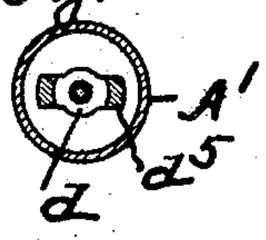


Fig. 4



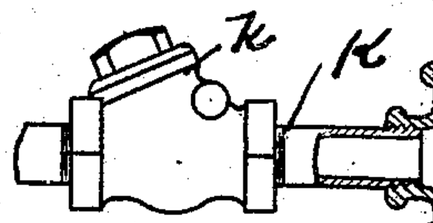


Fig. 5.

Witnesses

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2 SHEETS—SHEET 2.

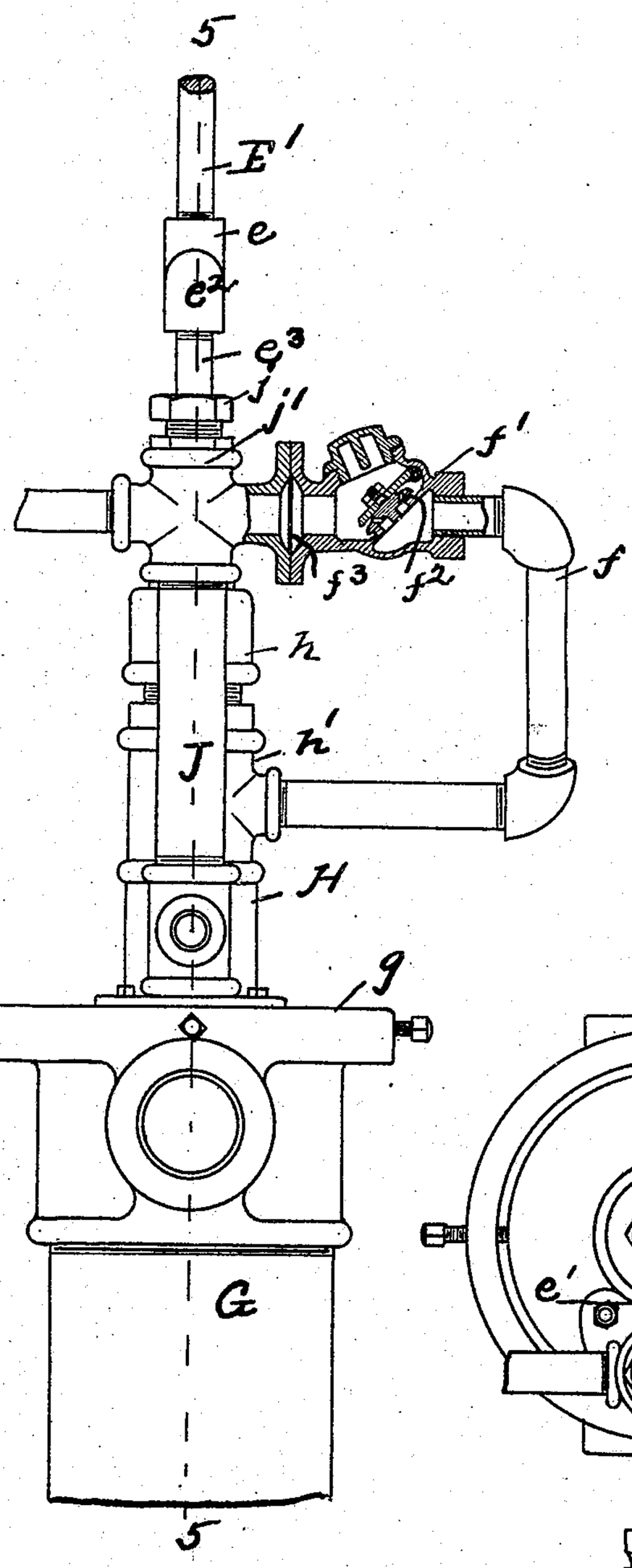
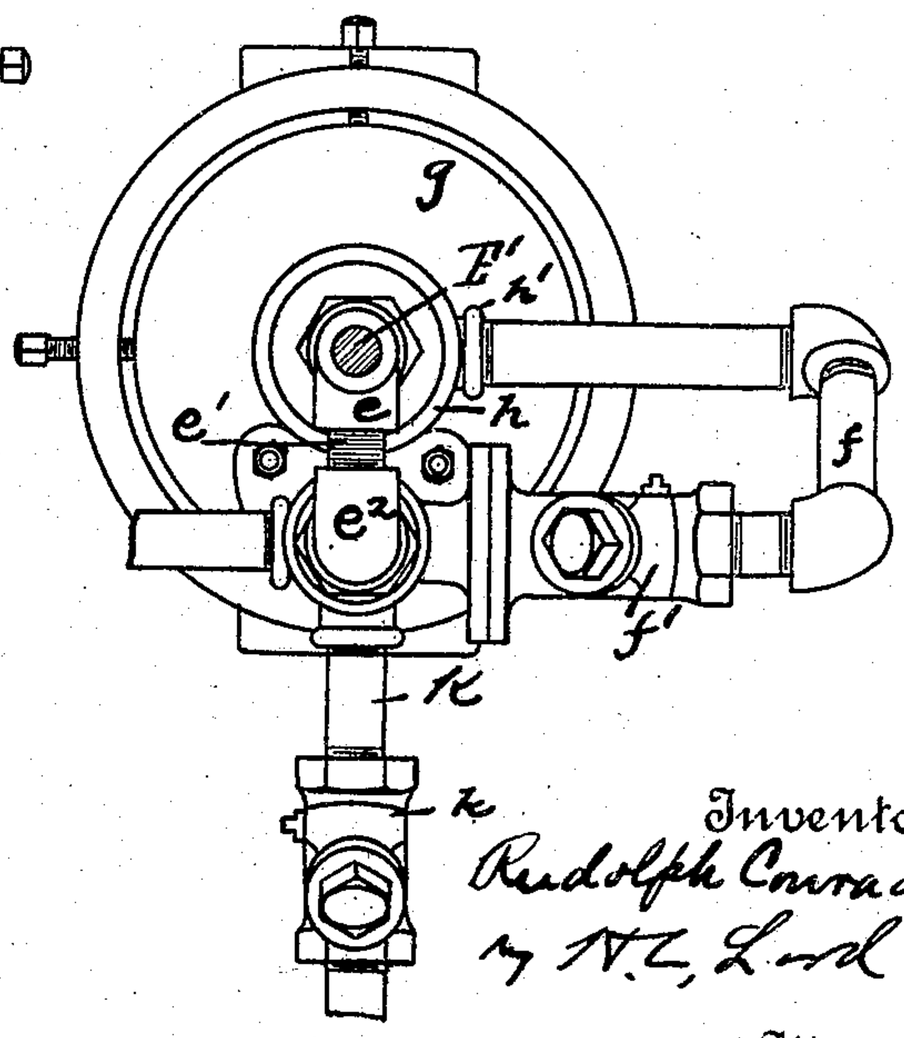


Fig. 6.

Fig. 7.



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UNITED STATES PATENT OFFICE.

RUDOLPH CONRADER, OF ERIE, PENNSYLVANIA.

PUMP.

936,605. Specification of Letters Patent. Patented Oct. 12, 1909.

Application filed April 24, 1905. Serial No. 257,184.

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 more particularly relates to that class of pumps which are used in Artesian wells and is peculiarly adapted for such wells and as shown is specially designed for oil wells.

The invention is illustrated in the accompanying drawings as follows:—

Figure 1 shows a central, longitudinal section through the working barrel of the pump, showing the contained parts. Fig. 2, a section on the line 2—2 in Fig. 1. Fig. 3, a section on the line 3—3 in Fig. 1. Fig. 4, a section on the line 4—4 in Fig. 1. Fig. 5, a central, longitudinal section of the casing head and apparatus at the top of the well, the section being on the line 5—5 in Fig. 6. Fig. 6, a side elevation of the apparatus at the top of the well. Fig. 7, a plan view of the same apparatus.

A marks the working barrel; A′, an extension thereon. The extension A′ is connected with the working barrel by the ordinary coupling *a*. The usual intake or strainer of the pump B is coupled to the extension A′ by means of the coupling *b*. This coupling has an interior socket construction for seating the standing valve C. The standing valve C comprises the frame *c* between which and the coupling *b* there is the packing ring *c′*. It is also provided with the cage c^2 in which is arranged the ball valve c^3. The upper end of the cage has the screw threaded opening c^4 for the purpose hereinafter described.

A plunger D operates in the working barrel. It is in the form of a tube. In the lower end of this barrel there is the valve seat and coupling *d′* which is screwed into the lower end of the plunger D. A spider *d* is arranged above the coupling to cage valve d^2. The coupling *d′* has the interiorly screw threaded opening d^3 at its lower end into which is screwed the plunger extension d^4, On the lower end of this extension is a coupling d^5 having side passages through it d^6. It has the screw threaded lower end d^7 which is adapted to enter the opening c^4 and engage the screw threads therein, so as to lift the standing valve. The upper end of the plunger D has the interior screw thread d^8 into which a coupling d^9 is secured. A hollow sucker rod E is connected with the coupling d^9 and extends to the top of the well. The tubing F is connected by a coupling *a′* with the top of the working barrel and extends to the top of the well with the usual construction. A vent d^{10} extends through the coupling *d′* from a point just below the end of the plunger D to a point just below the check valve d^2.

The principal purpose of the extension d^4 in this construction is to effect the pumping action without subjecting the surfaces of the working barrel A to contact with the oil which is passed through the pump with each operation. The oil ordinarily lifted from wells has a greater or less percentage of grit or sand in it, and this acting on the working surfaces of the working barrel under the tremendous pressure to which they are subjected very quickly cuts out and destroys the working parts of the pump which form the joint between the plunger and the working barrel. I prefer to make the extension the full length of the lift or longer but the purpose may be measurably accomplished if it is made the major portion of the lift. Starting with the pump operating as normal it will be noted that the entire space between the walls d^4 and the walls of the barrel is filled with a liquid and on the upward stroke of the plunger this liquid moves up with the plunger, the incoming liquid entering the working barrel about even with the end of the extension and follows up in this relative position to the upper end of the stroke of the plunger. It will be noted that when this occurs the lower end of the extension is at least even with the lowest point on the working barrel with which the plunger comes in contact. The working surfaces of the working barrel come in contact therefore only with the oil which has been retained in the barrel between the walls of the extension d^4 and the walls of the working barrel, that is these surfaces come in contact only with the clear oil which remains normally in the pump. On the down stroke of the plunger, liquid is forced through the passage d^6, extension d^4, by the valve d^2, through the plunger and through

the hollow sucker rod. The extension travels to near the bottom of the working barrel, so as to facilitate the removal of sediment from it. It will of course be observed that the liquid with which the extension is filled as the extension reaches its lowest point remains in the extension during the upward movement of the plunger extension, thus carrying out at the beginning of the downward stroke any sediment that may have entered the extension during the preceding downward stroke.

It will be observed that the mechanism so far as described will maintain a comparatively clean liquid between the walls of the extension d^4 and the walls of the working barrel by reason of the fact that this liquid remains in this position, and this permits any sediment to pass out of it during the operation of the pump. To more fully assure however the maintaining of a clear liquid in that part of the pump coming in contact with the working surfaces of the working barrel and plunger I prefer to maintain above the plunger a column of clear liquid which will, through pressure, prevent the leakage of liquid from beneath the plunger by it. To accomplish this purpose to the fullest extent the column of liquid should approximate in height the column of liquid lifted so that there may be a balancing of pressures and to take care of any leakage that may occur I prefer that this column be continuously supplied and in the most approved form by such minute quantities as will simply take up the leakage. With a pump so supplied with the extension and with the balancing column above the plunger, the working surfaces of the working barrel may be kept comparatively clean, thus permitting the use of metallic plungers if desired and assuring the continued use of the plunger for an extended period.

I have arranged a preferable means for supplying the column of liquid above the plunger as just hereinbefore referred to. The hollow sucker rod E extends through a stand pipe H having the usual gland h, the upper end of the sucker rod operating as a polish rod. The tubing F is secured in the usual casing head g and in the usual manner. The upper end of the sucker rod E is provided with a T coupling e and extending upwardly from this coupling is the extension E′ which is secured in the ordinary manner to a walking beam I by means of which the sucker rod is reciprocated in the operating of the pump. The sucker rod is extended and deflected through the T, e, nipple e', elbow e^2 and inverted tube e^3. This deflected portion reciprocates with the sucker rod. The inverted tube passes through the gland j and extends into the upright J. The upright J is connected with the pipe K which conveys the oil to any convenient point of storage and is provided with the usual check valve k. It will be noted that in this construction the sucker rod is deflected and extended and that the deflected portion reciprocates with the sucker rod, and that there is a coupling which connects this deflected portion with the comparatively fixed or stationary pipe leading to the storage receptacle. It will also be noted that by inverting the tube f^3 the gland j through which it operates may be formed in the upper end of the upright, and thus freed from contact with sediment and that the lower end being open to the storage pipe, any grit or foreign substances entering the upright passes immediately out of it, thus preventing any accumulation therein.

In the upper end of the upright J is provided the T coupling j' and into this is connected the pipe f which extends from said coupling to a coupling h' in the stand pipe H. A check valve f' is arranged in this pipe which prevents a flow from the upright J to the stand pipe H. There is a minute bypass f' however which permits a minute delivery of oil past the check valve. It will be noted that the oil that reaches the check valve comes from the upper end of the upright J, and that the lower end of the inverted tube e' will normally be below the upper end of the upright and that the liquid in the upper part of the upright has a chance to clear itself of sediment before passing into the pipe f'. To further assure clear oil, I interpose the strainer f^3. The use of the minute opening as distinguished from a full opening of the passage relieves the pump of a back pressure through its entire upward stroke. With the construction shown, the top of the column in the tube F and the extension thereof in the pipe f recedes from the check valve f' with the downward stroke of the plunger, and this minute delivery of oil takes place during this time. On the upward stroke of the plunger this column moves freely until it comes in contact with the check valve. If the delivery has been in excess of what the leakage by the plunger may be, the check valve is forced open and this excess expelled.

It is desirable to be able to remove the standing valve C with the extension, plunger and sucker rods. This may be accomplished by lowering the sucker rods, so as to bring the threaded portion d^7 in the threaded opening c^4. It is also desirable to relieve the sucker rods of the weight of liquid and to empty the sucker rods, so as to make it more convenient to handle after they are lifted. To accomplish this purpose I provide the pin L which is arranged in the extension d^4. It passes through the guide l in its upper end, the guide being open so as to permit the passage of liquid by it. Its

lower end has the reduced extension l' which passes through the bottom of the coupling d^5. The upper end of this reduced portion forms a shoulder l^2 which rests on this coupling. As the extension is screwed in the opening c^4 the lower reduced portion or end of this pin L contacts the valve c^3 and this holds the pin as the extension is lowered so that it forces the valve d^2 off from its seat, and holds it in this position as the parts are elevated so that those lifting the rods are relieved of the weight of this oil and this disagreeable feature incident to uncoupling the rods which would be otherwise filled with oil. It also permits of flooding the well.

It will be noted that the vent in this apparatus permits of the escape of gases which may accumulate in the pump barrel. The space between the walls of the extension and the walls of the barrel may through the action of the pump become filled with gases and with the column of liquid in the lift the presence of this gas would very seriously interfere with the normal operation of the pump. By arranging the vent as shown the trapped gas when it reaches a pressure through the action of the pump equal to the liquid in the lift will be forced through the vent and escape. This will permit an inflow of greater and greater amounts of liquid so that after a short operation of the pump all the gas may be expelled from the chamber. This action of the vent is supplemented by the leakage by the plunger which tends to maintain a full pump barrel at all times. This vent will measurably accomplish this purpose if arranged anywhere above the bottom of the extension. It will however be more efficient if arranged exactly at the top because then all the trapped gases may be expelled. The construction shown wherein the pump barrel forms a continuous working surface as distinguished from one in which the plunger is the long surface and the pump barrel short, is adapted for this purpose. Because of this, construction the vent may be placed at the top of the space between the extension and the barrel and always remain in this relation. It will be observed that with each stroke a working surface is exposed and where as shown the working barrel is the longer element a part of the working surface of the working barrel is exposed. In the broader phases of my invention I do not wish to be limited to this construction inasmuch as these relations may as to some features be reversed.

It will be noted that in the construction shown the extension d^4 is considerably smaller than the working barrel. By so making it, rough pipe or unfinished material may be used and at the same time the coupling d^5 may be attached in the ordinary manner and still be of a diameter to permit of its removal through the working barrel. It will be noted also that the coupling b which forms the socket for the standing valve is arranged within the barrel extension A′ and the upper end of the strainer B, so that its edge comes flush with the outer surfaces of these parts. This is particularly desirable in that it does away with any obstruction on the surface of these parts and thus facilitates the introduction of these parts to the lowermost parts of the well. I prefer to interpose the strainer f^3 in the pipe f so that nothing but strained liquid passes into this pipe. This strainer may be made very fine by reason of the fact that ordinarily there would be a little backward movement of liquid which will clean the strainer.

What I claim as new is:—

1. In a pump, the combination of a pump barrel; a pump plunger working in said barrel, the lower end of the plunger moving in working contact with the barrel the major portion of its stroke; and an extension from the lower end of the plunger of less diameter than the plunger extending the major portion of the length of the barrel exposed by the plunger in its upward movement, said plunger and extension having passages through which the liquid to be lifted may pass.

2. In a pump, the combination of the pump barrel; the pump plunger working in said barrel; an extension from the lower end of the plunger of less diameter than the plunger extending the major portion of the length of the working surfaces exposed in the movement of the plunger in the barrel, said extension and plunger having passages through which the liquid to be lifted may pass, and said extension having a free passage outside its walls extending from its lower end upwardly whereby a wall of liquid may be maintained between the extension and the walls of the pump barrel.

3. In a pump, the combination of the pump barrel; the pump plunger working in said barrel; an extension from the lower end of the plunger extending the major portion of the length of the working surfaces exposed in the movement of the plunger in the barrel and being of less diameter than the plunger, said extension and plunger having passages through which the liquid to be lifted may pass, and said extension having a free passage outside its walls extending from its lower end upwardly whereby a wall of liquid may be maintained and reciprocated between the extension and the walls of the pump barrel; and a check valve arranged above the extension and the bottom of the plunger.

4. In a pump, the combination of the pump barrel the pump plunger working in said barrel; an extension from the lower end of the plunger extending the major portion

of the length of the working surfaces exposed in the movement of the plunger in the barrel said extension and plunger having passages through which the liquid to be lifted may pass, and said extension having a free passage outside its walls extending from its lower end upwardly whereby a wall of liquid may be maintained between the extension and the walls of the pump barrel; a check valve arranged above the bottom of the plunger, and said extension having a vent through it below the check valve.

5. In a pump, the combination of a pump barrel; a pump plunger working in said barrel; an extension extending from the plunger a major portion of the length of the working surfaces exposed in the reciprocation of the pump, said plunger and extension having passages through which the liquid to be lifted may pass; and a check valve arranged at the bottom of the plunger, said extension having a vent extending through it near the top thereof and below the check valve.

6. In a pump, the combination of a pump barrel; a pump plunger working in said barrel, the lower end of the plunger moving in working contact with the barrel the major portion of its stroke; an extension with the lower end of the plunger extending the major portion of the length of the barrel exposed by the plunger in its upward movement, said plunger and extension having passages through which the liquid to be lifted may pass, said extension having a vent extending through its upper end.

7. In a pump, the combination with the working barrel; a plunger arranged in said barrel; an extension extending from the lower end of said plunger the major portion of the length of the working surfaces exposed in the operation of the plunger, said extension being of a diameter to permit of its removal through the working barrel; a standing valve at the lower end of the working barrel, said standing valve having a diameter to permit its removal through the working barrel; and means for locking the standing valve with the extension for lifting the standing valve.

8. In a pump, the combination with the working barrel A; the barrel extension A′; the coupling a for coupling the extension with the working barrel; a standing valve C in the lower end of the barrel extension; a plunger D arranged to operate in the working barrel A, said plunger being hollow; a hollow sucker rod connected with said plunger; the extension d^4 from the sucker rod; the coupling d^5 on the extension adapted to engage the standing valve, said extension and standing valve being of a diameter to permit of their removal through the working barrel.

9. In a pump, the combination with the working barrel; the plunger D therein having the check valve d^2 at the bottom thereof; the extension d^4 extending therefrom; the pin L arranged in said extension; the standing valve; means for coupling the standing valve with the extension, said means being arranged to force the pin L into engagement with the check valve to lift the same from its seat whereby the sucker rod may be drained.

10. In a pump, the combination with the working barrel; a plunger in said barrel; a hollow sucker rod connected with the plunger, said plunger being provided with passages for the movement of liquid through it to the sucker rod; and means for maintaining a column of liquid above the plunger.

11. In a pump, the combination with the working barrel; a plunger in said barrel; a hollow sucker rod connected with the plunger, said plunger being provided with passages for the movement of liquid through it to the sucker rod; and means for maintaining a column of liquid approximating the height of the lift upon the plunger.

12. In a pump, the combination with the working barrel; a plunger in said barrel; a hollow sucker rod connected with the plunger, said plunger being provided with passages for the movement of liquid through it to the sucker rod; and means for continuously delivering and maintaining a column of liquid above the plunger.

13. In a pump, the combination with the working barrel; a plunger in said barrel; a hollow sucker rod connected with the plunger, said plunger being provided with passages for the movement of liquid through it to the sucker rod; and means for continuously delivering and maintaining a column of liquid above the plunger to make a column approximating the height of the lift.

14. In a pump, the combination with the working barrel; a plunger in said barrel; a hollow sucker rod connected with the plunger, said plunger being provided with passages for the movement of liquid through it to the sucker rod; and means for delivering liquid above the plunger in minute quantities.

15. In a pump, the combination with the working barrel; a plunger in said barrel; a hollow sucker rod connected with the plunger, said plunger being provided with passages for the movement of liquid through it to the sucker rod; means for delivering liquid above the plunger in minute quantities; and a check valve for permitting a return movement of surplus.

16. In a pump, the combination with the working barrel; a plunger in said barrel; a hollow sucker rod connected with the plunger, said plunger being provided with passages for the movement of liquid through it to the sucker rod; a tubing connected with the working barrel approximating the

height of the lift and surrounding the sucker rod, said tubing being adapted to maintain a column of liquid on the plunger.

17. In a pump, the combination with the working barrel; a plunger in said barrel; a hollow sucker rod connected with the plunger, said plunger being provided with passages for the movement of liquid through it to the sucker rod; means for maintaining a column of liquid above the plunger; a tube connected with the working barrel; a connection between said tubing and the pipes for leading off the liquid from the sucker rod; said pipes; a check valve arranged against a flow toward the tubing, said tubing and check valve being provided with a bypass around the check valve.

18. In a pump the combination with the working barrel; the tubing extending from the working barrel to approximately the height of the lift; a plunger in the working barrel; a liquid weight on the plunger contained in said tubing and forming a column in said tubing approximating the height of the lift; and a lift pipe extending in alinement with the tubing to approximately the height of the lift for conveying the liquid to be pumped from the working barrel.

19. In a pump, the combination with the working barrel; a tubing extending from the working barrel to approximately the height of the lift; a plunger in the working barrel, said tubing being adapted to maintain a column of liquid on the plunger; means independent of the tubing for conveying the liquid to be pumped from the working barrel; and means for continuously delivering liquid to said tubing.

20. In a pump, the combination with the working barrel; a tubing extending from the working barrel to approximately the height of the lift; a plunger in the working barrel, said tubing being adapted to maintain a column of liquid on the plunger; means independent of the tubing for conveying the liquid to be pumped from the working barrel; and means for continuously delivering liquid to said tubing in minute quantities.

21. In a pump, the combination with the working barrel; a tubing extending from the working barrel to approximately the height of the lift; a plunger in the working barrel, said tubing being adapted to maintain a column of liquid on the plunger; means independent of the tubing for conveying the liquid to be pumped from the working barrel; means for continuously delivering liquid to said tubing in minute quantities; and a check valve arranged against a flow to the tubing and permitting of the expulsion of an excess therein.

22. In a pump, the combination of a working barrel; a hollow plunger in the working barrel; an extension extending from the plunger a distance approximately equal to the major portion of the surfaces exposed in the operation of the pump, said extension and plunger being arranged with passages for conveying the liquid to be pumped; and means for maintaining a liquid column on said plunger.

23. In a pump, the combination of a working barrel; a hollow plunger in the working barrel; an extension extending from the plunger a distance approximately equal to the major portion of the surfaces exposed in the operation of the pump, said extension and plunger being arranged with passages for conveying the liquid to be pumped; and means for maintaining a liquid on said plunger approximating in pressure on the plunger of a column of liquid the height of the lift.

24. In a pump, the combination of a working barrel; a hollow plunger in the working barrel; an extension extending from the plunger a distance approximately equal to the major portion of the surfaces exposed in the operation of the pump, said extension and plunger being arranged with passages for conveying the liquid to be pumped; means for maintaining a liquid column on said plunger; and means for conveying the liquid pumped from the passages in the plunger independently of the column on the plunger.

25. In a pump, the combination of a working barrel; a hollow plunger in the working barrel; an extension extending from the plunger a distance approximately equal to the major portion of the surfaces exposed in the operation of the pump, said extension and plunger being arranged with passages for conveying the liquid to be pumped; and means for maintaining a liquid column on said plunger, said extension having a vent through it for the escape of trapped gases.

26. In a pump, the combination of a hollow sucker rod for conveying the liquid pumped; a deflected extension on the top of the sucker rod, said extension being arranged to reciprocate with the sucker rod; and a coupling for connecting said extension with a comparatively fixed or stationary storage pipe; said coupling being arranged to convey liquid under pressure from the sucker rod to the storage pipe; and said storage pipe.

27. In a pump, the combination of a hollow sucker rod for conveying the liquid pumped; an extension on said sucker rod; a telescopic coupling on said extension for connecting said sucker rod with the storage pipe; said coupling being arranged to convey liquid under pressure from the sucker rod to the storage pipe; and said storage pipe.

28. In a pump, the combination of a hollow sucker rod for conveying the liquid pumped; an extension on said sucker rod comprising an inverted tube; an upright in

which said tube operates; and a gland at the top of said upright forming a joint around said inverted tube.

29. In a pump, the combination of a pump barrel; a hollow plunger therein; a hollow sucker rod connected with said plunger; a tubing connected with the barrel adapted to maintain a liquid on said plunger; an extension on said sucker rod comprising an inverted tube; an upright in which said tube operates; and a bypass from the upper end of said upright to the tube for maintaining liquid on the plunger.

30. In a pump, the combination of a pump barrel; a pump plunger working in said barrel; an extension from the lower end of the barrel extending the major portion of the working surfaces between the barrel and plunger exposed in the movement of the plunger in the barrel, said extension and plunger having passages through which liquid to be lifted may pass, and said extension being of a smaller diameter than the working barrel, to permit of a wall of liquid between the walls of the extension and the walls of the working barrel, and of a diameter to permit of its removal from the working barrel.

31. In a pump, the combination with the working barrel; a plunger in said barrel; a hollow sucker rod connected with the plunger, said plunger being provided with passages for the movement of liquid through it it to the sucker rod; means for continuously delivering and maintaining a column of liquid above the plunger; and a strainer through which the liquid delivered above the plunger is passed.

32. A pumping apparatus having a hollow plunger of a length to extend outside the well, a working barrel therefor having a snug-fitting lower portion, a liquid packing receiving chamber having an imperforate wall about a portion of said plunger above said snug-fitting portion, means being provided for supplying liquid to said chamber, a valve interposed in said plunger, a standing valve at the bottom of said working barrel, and means for reciprocating said plunger.

33. In a pump, the combination of a pump barrel, a plunger working in said barrel, a plunger extension below the plunger, said plunger and extension having a passage therein for the liquid to be lifted, means for reciprocating the plunger, said means, barrel and plunger being arranged and constructed to prevent that part of the extension coming in contact with the liquid to be pumped from contacting the working surfaces of the barrel.

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

RUDOLPH CONRADER.

Witnesses:

CLINTON B. BURGESS,

M. C. SULLIVAN.