Dec. 29, 1936. J. C. SHAFFER ET AL 2,065,541

WELL PUMP

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FIG. 1.

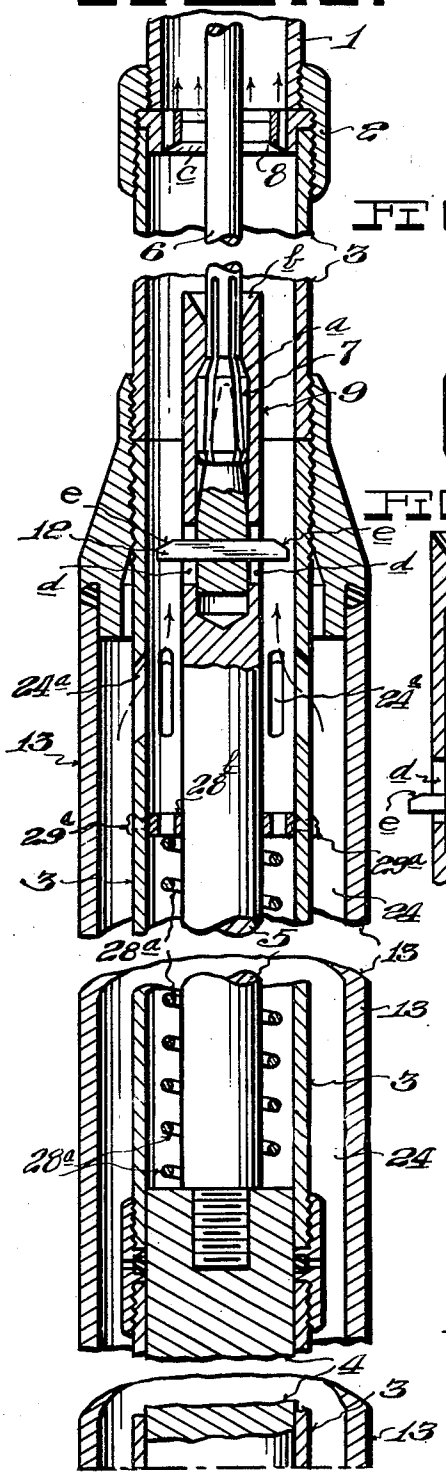


FIG. 8.



FIG. 9.

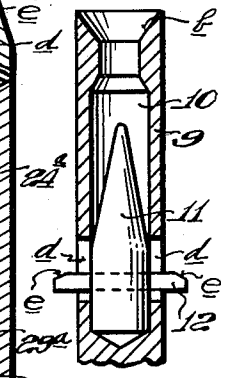
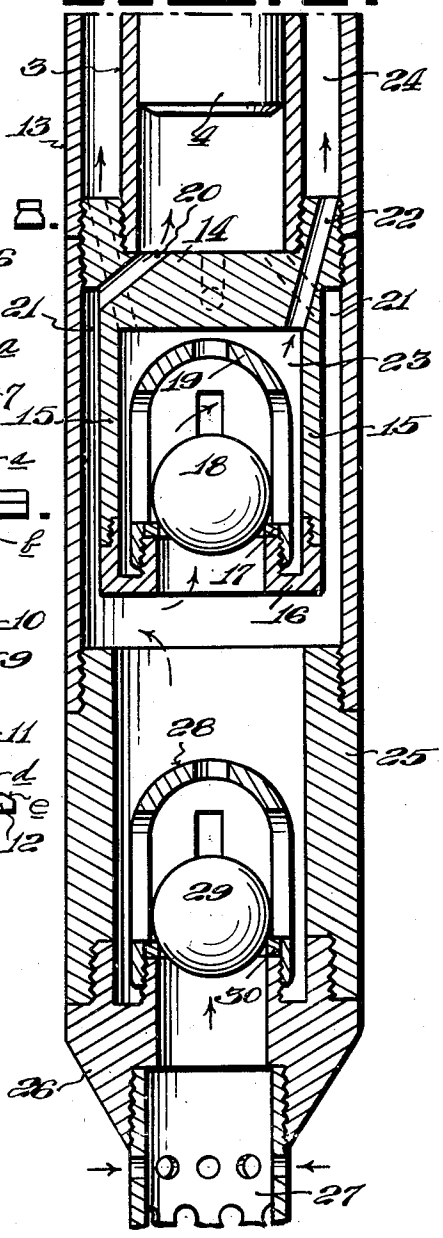


FIG. 2.



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FIG. 3.

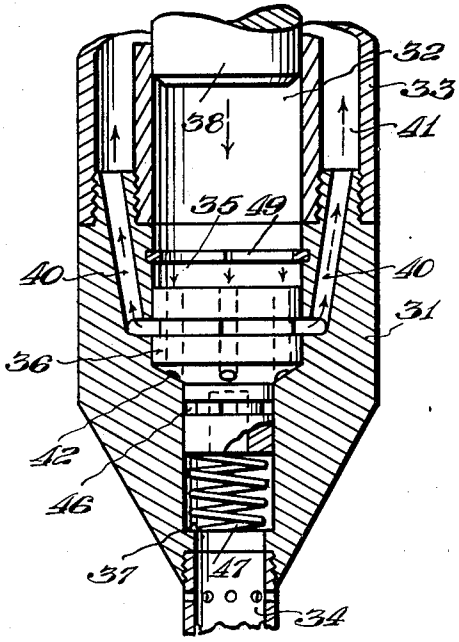


FIG. 4.

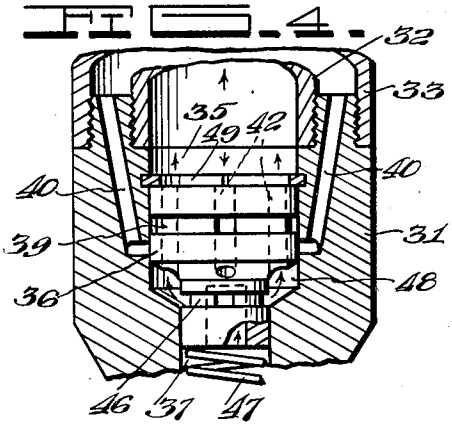


FIG. 5.

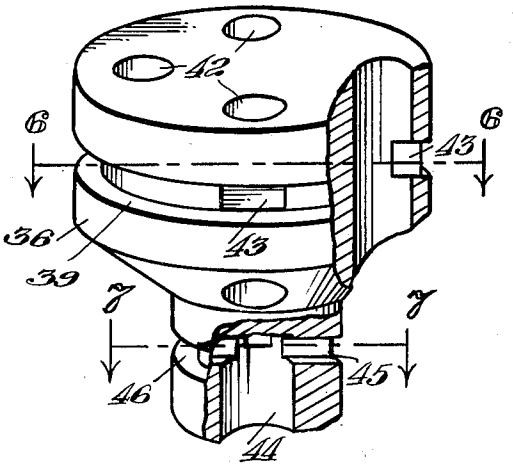


FIG. 6.

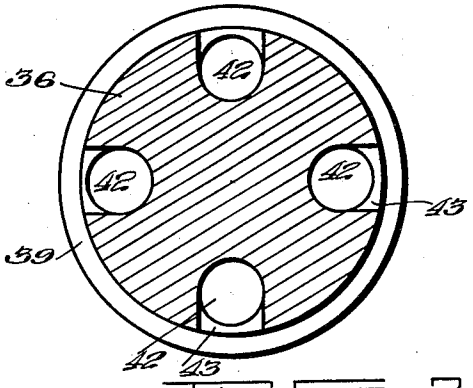
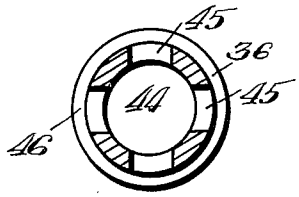


FIG. 7.



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FIG. 10.

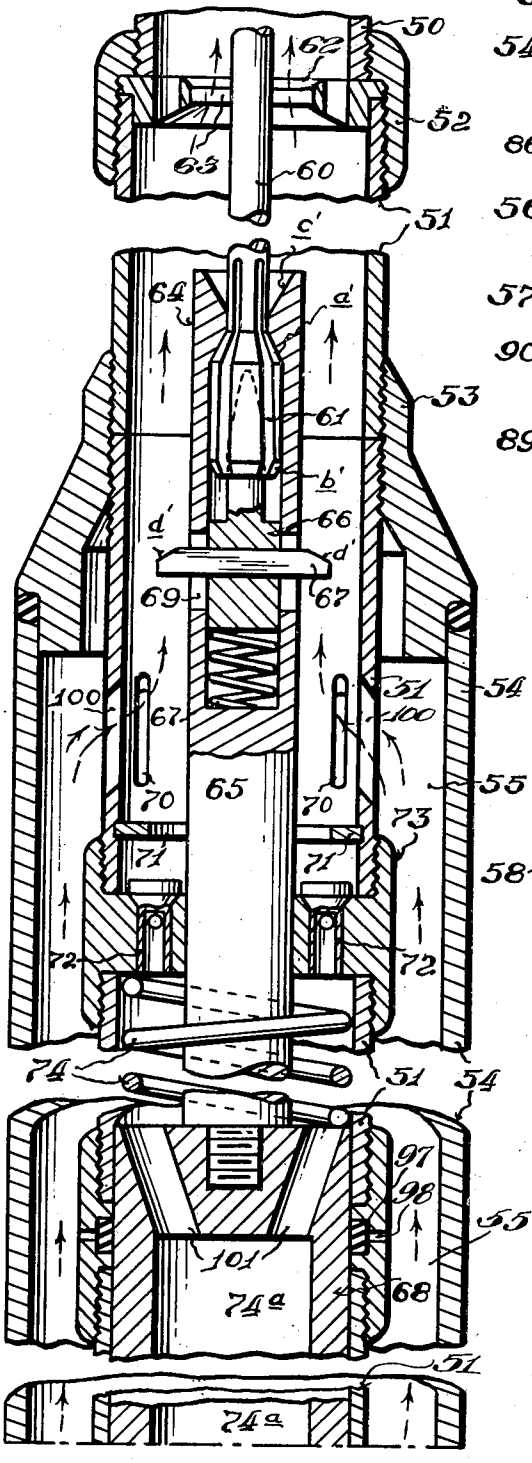
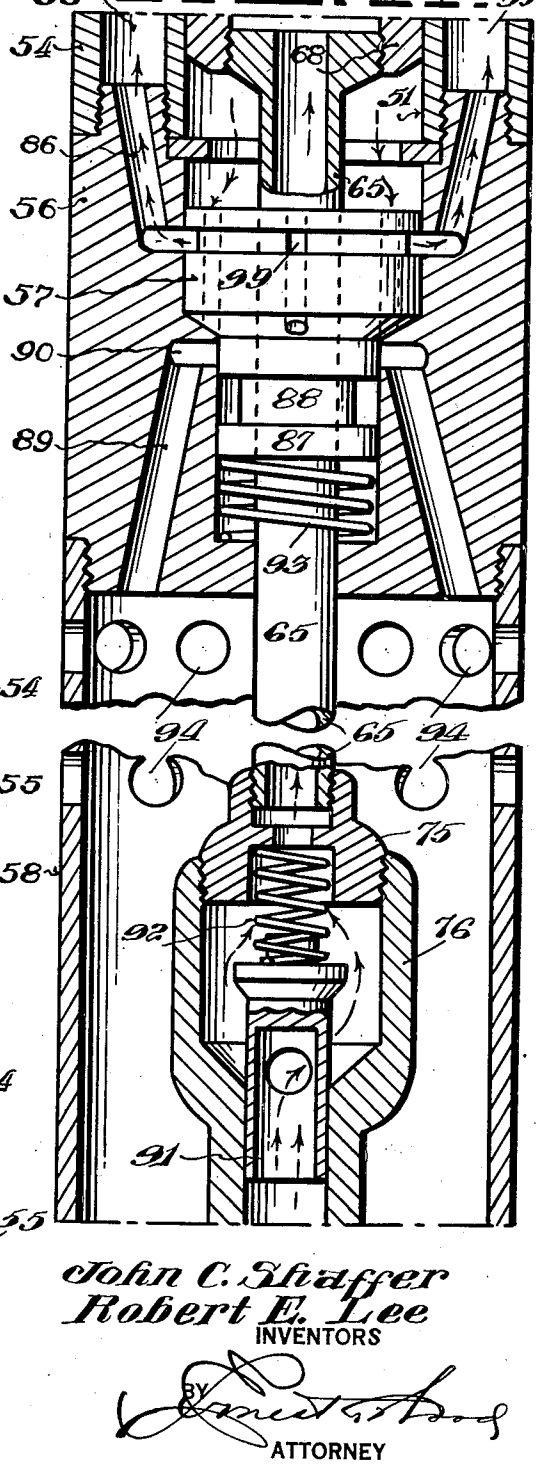


FIG. 11.



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FIG. 12.

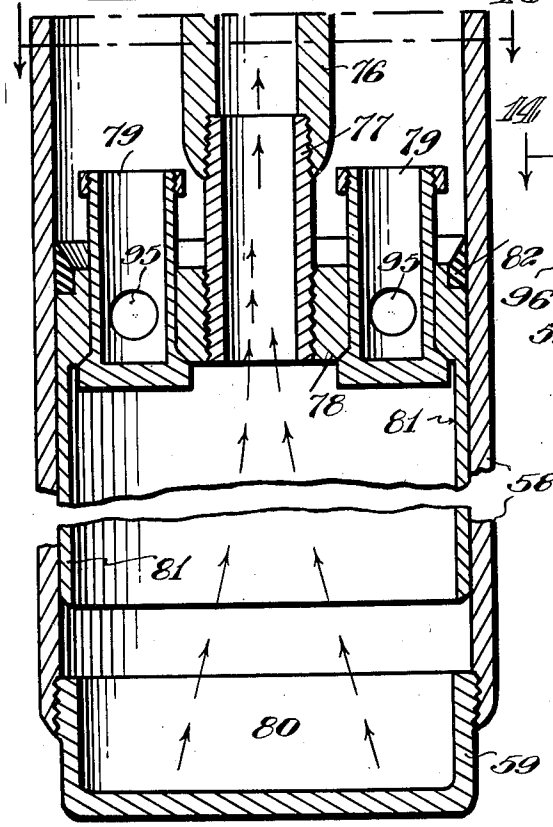


FIG. 13.

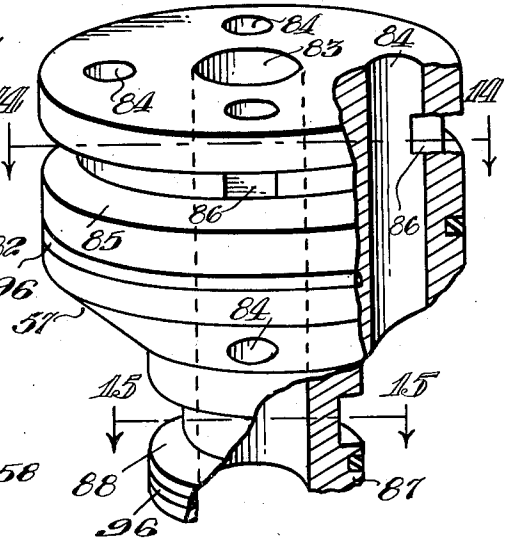


FIG. 14.

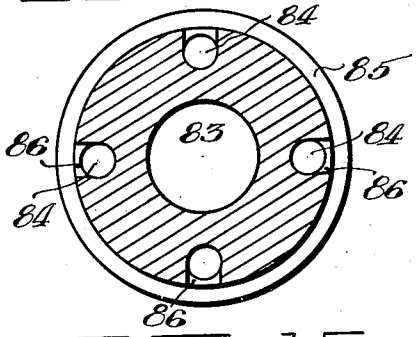


FIG. 16.

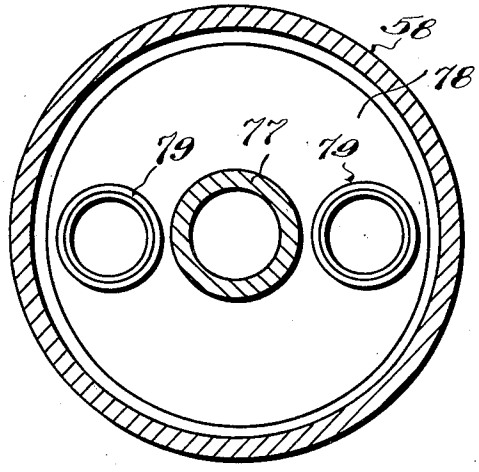
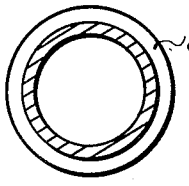


FIG. 15.



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FIG. 17.

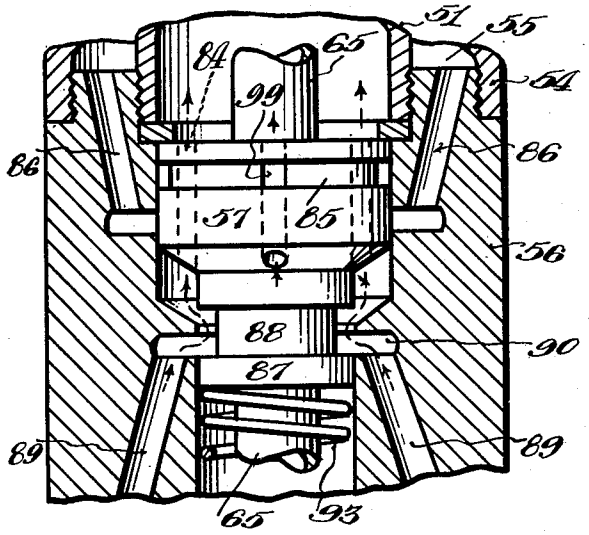


FIG. 20.

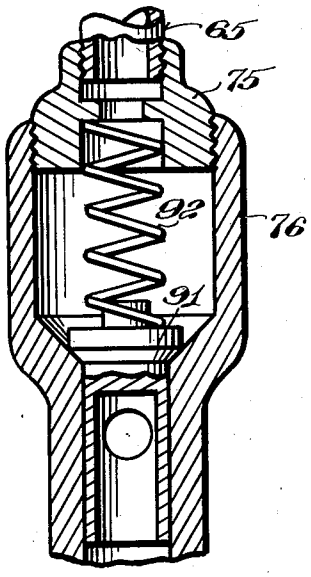


FIG. 18.

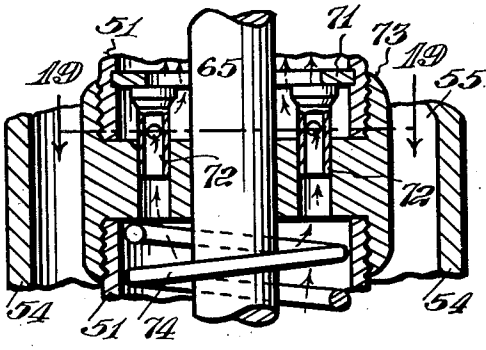


FIG. 21.

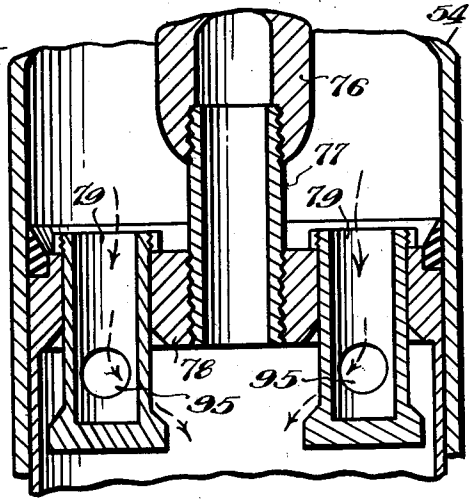
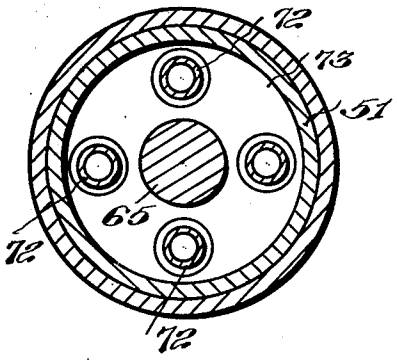


FIG. 19.



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Patented Dec. 29, 1936

2,065,541

UNITED STATES PATENT OFFICE

2,065,541

WELL PUMP

John C. Shaffer and Robert E. Lee, Coleman, Tex.; said Robert E. Lee, assignor to Margaret L. Shaffer, Corpus Christi, Tex.

Application April 29, 1935, Serial No. 18,865

12 Claims. (Cl. 103—155)

This invention relates to fluid lift pumps and it has particular reference to new and useful improvements in pumping apparatus designed especially for oil field work.

The principal object of the invention is to provide a fluid pump designed to operate in a well and is so constructed as to provide for greater capacity with little or no increase in the power required for its operation. Moreover, the peculiar design of the apparatus is such as to lend materially to smoothness of performance over conventional types of fluid elevating apparatus.

Another object of the invention is to provide a valve assembly cooperating with the pump plunger in such manner as to reduce to the minimum the friction usually present in most types of pump units whereby to increase materially the volume of fluid displaced and which feature is instrumental in relieving the strain upon the surface equipment and consequently is a factor in minimizing the amount of power required to actuate the pump, particularly since the pump is so designed that the weight of the pump rod assembly is utilized in effecting fluid displacement.

Another object of the invention is to simplify the valve arrangement of the pump by reducing the number of valves ordinarily required to handle the fluid and by associating them in such manner that they may be readily accessible for assembling and disassembling the structure as well as to handle the fluid in the most effective manner.

Yet another object of the invention is to provide a pump plunger which does not require the usual cups and is therefore capable of operation for longer periods of time since the passage of sand entrained in the fluid will have little effect in rendering the plunger inoperative or reducing its effectiveness. Moreover, the invention aims to provide a novel means for effecting connection and disconnection of the pump rod asembly to the pump plunger, without requiring that the latter be withdrawn from the well.

Another object of the invention is to provide through a novel valve assembly, a hollow piston and piston rod, a double acting fluid and liquid pump where both the up stroke and the down stroke are utilized for effective fluid dislacement, and due to the comparatively large concentric chambers surrounding the moving parts of the pump, much greater fluid capacity is obtained.

Yet another object of the invention is to provide a novel packing means whose effectiveness is largely dependent upon fluid pressure to which the packing is exposed and which fluid pressure urges the packing firmly against the adjacent wall of the moving or stationary portion of the pump.

With the foregoing objects as paramount, the invention has particular reference to its salient features of construction and arrangement of parts which will become manifest as the description proceeds, taken in connection with the accompanying drawings, wherein:—

Figure 1 is a vertical section through the upper portion of a pump constructed according to the present invention and which is broken to show extension.

Figure 2 is a continuation of Figure 1 showing in vertical section the lower portion of the apparatus.

Figure 3 is a vertical section of a modified form of valve structure which may substitute for that shown in Figure 2.

Figure 4 is a fragmentary view of the valve structure shown in Figure 3, showing the valve in displaced position during indrawing of the fluid.

Figure 5 is a perspective view of the valve per se with portions broken away.

Figure 6 is a transverse section on lines 6—6 on Figure 5.

Figure 7 is a transverse section on lines 7—7 on Figure 5.

Figure 8 is a detail view of the lower end of the pump rod assembly.

Figure 9 is a view of an element carried by the upper end of the plunger rod and cooperating with the device shown in Figure 8 to effect connection and disconnection of the pump rod with respect to the plunger.

Figure 10 is a vertical section through the upper portion of the double acting pump which is a modification of Figures 1 to 9 inclusive.

Figure 11 is a continuation of Figure 10 showing in vertical section the intermediate portion of the modified pump.

Figure 12 is a vertical section of the lowermost end of the modified pump structure.

Figure 13 is a detail view in perspective of one of the valves employed in the modified structure, showing a portion broken away to illustrate the fluid passage.

Figure 14 is a transverse section on lines 14—14 on Figure 13.

Figure 15 is a transverse section on lines 15—15 on Figure 13.

Figure 16 is a transverse section on lines 16—16 on Figure 12.

Figure 17 is a fragmentary view of the body of the pump showing the valve in elevation as illustrated in Figure 13.

Figure 18 is a fragmentary view of the body of the pump showing a group of valves and their relationship with the plunger rod.

Figure 19 is a transverse section on Figures 19—19 on Figure 18.

Figure 20 is a detail view of the lower valve shown in Figure 11 and Figure 21 is a detail view of the lowermost valve assembly shown in Figure 12.

Continuing with a more detailed description of the drawings, 1 designates the tubing assembly to which is connected by means of the collar 2 the pump cylinder 3. This cylinder may be of any desired length, depending upon the length of the stroke of the plunger or piston 4, shown broken in Figures 1 and 2. Threaded into the plunger 4 is a rod 5, whose upper end is shaped in a manner shown in detail in Figure 9.

Referring specifically to Figures 8 and 9, illustrating the connection between the rod 5 and pump rod 6, it will be noted that the lower end of the rod 6 is shaped to define a head comprised of a series of flexible fingers 7, beveled at *a*. It will be understood that the pump plunger remains enclosed within the cylinder 3 and is not removed except when the tubing assembly is withdrawn from the well, the elements shown in Figures 8 and 9 being effective in affording a means of connecting the plunger with the pump rod assembly. When the rod assembly is lowered into the tubing, the head 7 on the lowermost section engages the beveled collar 8 and when the bevel *a* of the head strikes the beveled upper portion of the collar 8, the fingers are thus collapsed, allowing the head to be passed through the opening in the collar 8 and continued downward until the beveled portion *a* of the head engages the bevel *b* in the hollow upper end 9 of the pump rod 5. Further downward movement of the pump rod will cause the head 7 to enter the cavity 10 in the portion 9 of the plunger rod, whereupon the fingers 7 of the head will embrace the engaged cone shaped pin 11 and will thereby be expanded. It is therefore obvious that the head 7 cannot escape from the cavity 10 of the plunger rod until the disconnected operation is carried out.

It will be noted in Figure 1 that the collar 8 is likewise beveled at *c* underneath and also, that the upper porton 9 of the plunger rod 5 is slotted at *d*. A key 12 is passed through these slots and through an opening in the pin 11. The ends of the pin 12 are beveled at *e*, as shown particularly in Figure 9. When it is desired to disconnect the plunger from the pump rod 6, the latter is elevated until the beveled ends *e* of the pin 12 impinge the beveled surface *c* of the collar 8. When this occurs, the obvious result would be the movement of the pin 12 to the bottom of the slots *b*, thereby displacing the pin 11 downwardly and out of its wedged relationship with the head 7. Further pull upon the rod 6 will again collapse the fingers of the head 7, allowing it to be pulled through the reduced portion of the member 9 and through the collar 8.

Providing a connection between the pump barrel or cylinder 3 and the outer shell 13 is an interiorly and exteriorly threaded plug 14 shown in Figure 2 which has a depending skirt 15. This skirt has threaded upon its lower end a valve seat mounting 16, supporting a valve seat 17 on which rests a ball 18. The ball is embraced by the conventional cage 19. It will be observed also in Figure 2 that a fluid passage 20 in the plug 14 effects communication between the annular chamber 21 and the pump barrel or cylinder 3. Another and similar passage 22 effects communication between the valve chamber 23 and the annular chamber 24 between the pump barrel 3 and outer shell 13.

Threaded to the lower end of the shell 13 is a valve chamber 25 and into the lower end of this chamber is threaded the plug 26 which is preferably beveled as shown. A perforated tube or strainer 27 is threadedly received in the end of the plug 26 and may be of any desired length. The plug 26 is so formed as to provide a mounting for the valve cage 28 in which a ball 29 rests upon a removable seat 30.

An expansion spring 28*a* is disposed between the plunger 4 and a collar 28*b*, which is fixed by interpositioning between sections of the pump barrel 3, similarly to the disposition of the collar 8, or by set screws 29*a*, as shown. It will be observed, however, that this collar is open to the free passage of fluid.

The spring 28*b* maintains a tension on the pump plunger, and is instrumental in overcoming the usual slackness in the pump rod assembly and assists the plunger in the assurance that maximum effectiveness is obtained on the down stroke of the pump plunger.

In operation, the upstroke of the plunger 4, which is of composition material, will create a vacuum in the annular chamber 21 and which will raise the valve 29 to permit fluid to enter the valve chamber 25 and which fluid will pass upward through the passage 20 and fill the unoccupied space in the pump barrel 3 below the plunger 4. On the down stroke of the plunger 4, the fluid will reverse itself, return the valve 29 to closed position and due to the pressure imposed thereupon by the plunger, the fluid will lift the valve 18 from its seat to fill the valve chamber 23 and will pass into the annular chamber 24 through the passage 22. It is obvious that continued actuation of the pump plunger 4 will build up the column of fluid in the annular chamber 24 to the surface through the tubing 1 which it enters from the annular chamber 24 by passing through the slots 24*a* in the pump barrel 3 which effects communication between the annular space 24 and the tubing 1.

The peculiar construction of the assembly just described is such that more space is provided for the reception and conveyance of fluid, consequently affording a pump of greater fluid capacity and, further, less constriction of fluid which enables the pump to handle fluid with entrained sand more effectively than conventional types of pumps, with less wear upon the moving parts. Moreover, due to the long strokes of the pump plunger, there is less likelihood of creating objectionable emulsions which frequently are instrumental in holding the valves open and reducing the efficiency of the pump.

Referring now particularly to Figures 3 to 7 inclusive, showing a modified form of valve construction, it is pointed out that a plug 31 is threaded jointly to the pump barrel 32 and outer shell 33. The plug 31 has threaded into its lower end a perforated tube 34 and is recessed as at 35 to receive a valve 36 of peculiar construction, which will be described in detail presently. The

recess 35 continues in reduced diameter to provide a passage 37 through which fluid travels upwardly when the pump plunger 38 is actuated.

The peculiar type of valve is shown in detail in Figure 5 and is preferably constructed of one piece of material. The upper or large portion of the valve has an annular groove 39 in its periphery and which groove effects communication between a series of relatively spaced fluid passages 40 in the upper portion of the plug 31 when the valve is seated as shown in Figure 3. These passages 40 effect communication between the annular groove 39 of the valve and the annular space 41 between the pump barrel 32 and shell 33. The valve 36 has a series of longitudinally arranged passages 42 which extend entirely through the head or enlarged portion of the valve and due to the apertures 43 in spaced relationship around the valve and within the annular groove 31, communication is had between the vertical passages 42 and the said groove 39 and consequently with the passages 40 in the plug 31. An axial passage 44 is provided in the reduced end of the valve 36, in the upper end of which are apertures or passages 45. These latter passages are in communication with an annular groove 46 about the reduced lower end of the valve. An example of this arrangement is shown in Figure 7. When the valve 36 is in closed position as shown in Figure 3, all of the fluid passages 45 are sealed off but when it is lifted by the vacuum created within the pump barrel 32 by the plunger 38, aided by the spring 47 below the valve, the valve moves to the position shown in Figure 4 which allows fluid to pass upwardly through the axial passage 44 and through the radial passages 45, into the chamber 48, created by the upward displacement of the valve 36. When the valve is in this position, fluid is permitted to continue upwardly through the co-axial passages 42 and into the pump barrel 32 below the plunger 38. It will be noted in Figure 4 that the passages 40 are sealed off by the valve itself and it will be further noted that the valve 36 is limited in its upward movement by means of a split spring 49, situated in an annular recess around the walls of the chamber or recess 35.

In operation, on the up stroke of the plunger 38, fluid is drawn into the valve chamber 48 through the passage 44, radial passages 45 and co-axial passages 42 into the pump barrel 32. The spring 47 aids the plunger 48 in displacing the valve by overcoming the point of equalization of fluid pressure in the annular groove 49 and the passages 40 as the valve moves past the communicating point of these passages. Fluid is thus entrapped within the pump barrel 32 before the downstroke of the plunger 38 takes place. When this occurs, pressure on the valve head will move the same downward against the resistance of spring 47, to the position shown in Figure 3, in which position, the longitudinally arranged passages 42 are sealed off and the fluid has no alternative but to pass through the passages 43 spaced radially around the valve head, thence into the passages 40 and finally into the annular space 41 where it remains until the pump plunger 38 is again actuated and which action will progressively raise the column of fluid to the surface.

Figures 10 to 21 inclusive illustrate the modified form of well pump herein referred to as a double acting pump. By this term is meant a pump having the property of first drawing fluid from the sand into the lowermost chamber of the assembly; transferring the fluid by plunger pressure into one or more of the upper chambers and suspending the fluid thus displaced preparatory to its introduction into and conveyance through the tubing assembly by which the pump is suspended in the well.

Figures 10, 11 and 12 are continuations of the double acting pump and referring to Figure 10, it will be noted that the tubing assembly 50, fragmentarily shown, suspends the pump barrel 51 through the medium of a collar 52. A tapered sleeve 53 affords connection between the section of the pump barrel 51 and serves the joint purpose of providing a support for the shell 54 which defines the annular or concentric fluid chamber 55.

The lower end of the shell 54 is interiorly threaded to receive the connection 56, which is in fact a valve mounting for the valve 57, shown in detail in Figure 13. To the lower end of the connection 56 is connected the threaded tubular member 58 and into the lower member of this member 58 is threaded a bull plug 59, shown in Figure 12.

Referring again to Figure 10, it will be observed that the pump rod assembly 60 is provided with an expansible head 61 having a bevel *a'* at its top and a similar bevel *b'* at its bottom. A beveled ring 62 is fixed at the point of engagement between the tubing assembly and pump barrel 61 and is perforated radially as shown. A central passage 63 is provided through which passes the pump rod 60. The head 61 carried by the lower portion of the pump rod assembly 60 is guided into the recess in the upper end 64 of the pump plunger 65 by means of the bevel *c'* interiorly of the upper end of the plunger 64. Within the cavity of the pump plunger 64 is reciprocatably mounted a member 66, shown in Figure 10, which is transversely apertured to receive a pin 67 having beveled ends *d'* and under this member 66 is a spring 67 which is effective in urging the member 66 upward.

When the pump rod assembly is set down within the pump barrel 51, the upper bevel of the collar 62 contacts the head 61 so that it will pass through the aperture in the collar and when the head engages the heads *c'* it is again compressed, to again expand within the recess provided in the upper end of the stem 65. When thus received, the tapered upper end of the pin or member 66 expands the fingers of the head 61 outwardly against the inner walls of the stem to hold the same against displacement during reciprocation of the pump plunger 68.

The member 66 being transversely apertured to receive the pin 67, a slot 69 must be provided in the plunger 65 to receive this pin. Should it be desired to release the plunger from engagement with the rod line assembly 60, it is necessary only to elevate the assembly to such point that the bevel *d'* will come into contact with the beveled undersurface of the collar 62, shown in the upper portion of Figure 10. The beveled upper end of the pin 66 will be thus withdrawn from the expandible head 61 of the rod line 60, allowing the said head to contract and be thereby capable of being withdrawn from the upper end 64 of the plunger rod 65.

It will be noted in Figure 10 also that slots 70 are provided in the walls of the pump barrel 51 and which slots communicate with the annular chamber 55 designed by the shell 54. Immediately below these slots is a ring 71 which affords a stop for the valves 72. These valves are arranged in a valve mounting 73 in radial relation-

ship to the plunger rod or stem 65. The valve mounting 73 also provides a connection between the joints of the pump barrel 51. A spring 74 is interposed between a shoulder of the valve mounting 73 and the upper end of the pump plunger 68. The spring 74 serves the important function of relieving the rod line 60 of side stresses on the downward stroke, since it assumes the greater portion of the stress applied thereto by fluid pressure and prevents buckling to a maximum degree.

It will be observed in Figure 10 also that the lower end of the plunger stem 65 is threaded into the upper end of the plunger 68, the latter being hollow to define a fluid chamber 74*a*, as shown in Figure 10. Referring to Figure 11, it will be noted that a continuation of the plunger stem 65 is threaded into the lower end of the hollow plunger 68 and this stem is likewise hollow or tubular but is referred to by the same reference character 65. This stem continues downward, through the valve 57 and is threaded into the upper end of a plug 75. The plug 75 is in turn threaded into a valve cage 76 which latter, at its lower end, receives tubular member 77. The lower end of the tubular member 77 is threaded into a plate or disk 78 which has a series of perforations about its central axis to receive an equal number of tubular valves 79. The tubular member 77 communicates with a chamber 80, as shown in Figure 12 which is closed by a bull plug 59 as mentioned previously.

The plate 78 has a skirt portion 81 which is machined to be smoothly received within the lower portion 58 of the pump body, as shown in Figure 12, and which plate and skirt portion is vertically movable within the said lower portion of the pump.

A packing ring 82 is mounted in the upper portion of the plate 78 and is retained in fixed relation to the plate so that it will slide on the walls of the tubular member 58 comprising the lower portion of the pump body.

Before entering into the operation of the pump, attention is directed to the fact that the valve 57, as shown specifically in Figure 13 is centrally apertured at 83 to provide for the passage therethrough of the tubular pump plunger rod 65. In axial relationship about this central aperture 83 are passages 84 which communicate with an annular recess 85 through the medium of passage 86. It will become known through the description of operation that the passages 84 communicate with the annular recess 85 and in turn with the annular passage 86 when the valve 57 is in the position shown in Figure 11 or on the down stroke of the pump plunger 68. The peculiar construction of the valve shown in Figure 13 provides for a reduced lower end 87 in which is provided an annular groove 88 which becomes intermittently alined with fluid passages 89 or rather with an annular fluid chamber 90 as shown in Figures 11 and 17.

Immediately below the valve 57 is a valve 91, shown in detail and in closed position in Figure 20. While it may not be necessary for successful operation, a spring 92 normally urges the valve 21 to closed position. This valve is shown in Figure 11 open to the passage of fluid.

The valve 57 is likewise provided with a spring 93 which normally urges the valve 57 to open position, aiding the plunger 68 to so actuate the valve.

In operation, fluid entering from the well through the apertures 94 of the lowermost tubular member 58 is received in the chamber 80 below the valve assembly 79, since these valves are in the open position shown in Figure 21 on the up stroke of the plunger 68, enabling the fluid to enter the chamber 80 through the ports 95, as shown by the arrows in Figure 21. It may be stated at this point that the fluid entering the tubular member 58 has two courses in which to escape from the chamber into the upper regions of the pump. One is upwardly through the passages 89 and the other is downwardly through the valve 79, as explained, preparatory to being urged upwardly through the central passage defined by the tube 77 in a manner to be presently explained.

The chamber 80 having been filled with fluid, the down stroke of the plunger 68 will effect downward movement of the plate 78 and fluid pressure will urge the valve 79 to the closed position shown in Figure 12. Fluid from the chamber 80 is thus forced upwardly through the passage extending through the plunger stem 65, thereby lifting the valve 91, as shown in Figure 11, against the resistance of spring 92. Fluid thus passing the valve 91 continues upward through the hollow stem 95 and into the chamber 74*a* within the plunger 68. From this chamber 74*a*, the fluid passes into the chamber defined by the tubular pump barrel 51 immediately surrounding the plunger stem 65, the latter being solid above the plunger. Fluid thus entering the pump barrel 51 raises the standing valves 72 grouped about the plunger stem 65 and is thus prevented from returning to a lower level upon reverse action of the plunger.

It has been stated previously that fluid from the tubular member 58 is likewise capable of passing upwardly through passages 89, into the annular cavity 90. This is accomplished either by pump suction set up within the pump barrel or by well pressure. In this connection reference is made to the valve 57 which controls the fluid thus passing. It will be noted in Figure 13 that packing rings 96 surround the valve 57 to close off the fluid between the valve and its chamber. These packing rings are shown in the detail view of the valve in Figure 13 but may be incorporated in the structure if it is found that such packing is necessary or desirable.

The foregoing describes the action of the fluid on the down stroke of the plunger and since the fluid thus displaced is now suspended in the pump by the valves 91 and the standing valve assembly 72, the up stroke of the pump plunger against the resistance of the spring 74 will displace the valve 57 to the position shown in Figure 17, aided by the spring 93 below the valve 57. It will be noted in Figure 17 that the annular cavity 70 is open to the upward passage of fluid from the chamber defined by the tubular member 58, through the passage 89. Fluid is now permitted to be drawn by suction of the pump plunger into the chamber of the pump barrel 51 immediately below the plunger through the axial passages 84 extending through the valve 57 and fluid continues to be so drawn so long as the plunger continues upwardly. It will be particularly observed in Figure 10 that the plunger 68 is provided with a packing ring 97, maintaining a close fit between the plunger and pump barrel 51. As an aid in maintaining this condition, the threaded collar provides a connection between sections of the pump barrel and is apertured radially at 98 so as to expose the packing 97 to exterior fluid pressure within the shell

55. It will be understood that this structure may be reversed so that internal fluid pressure may act upon the packing. The structure may also be employed to seal off fluid at other points in the assembly and particularly around the skirt 81 which slidingly engages the walls of the tubular member 58 to the lower end of the pump, shown in Figure 12.

Upon the down stroke of the plunger 68, pressure is brought to bear on the fluid within the chamber below the plunger. Obviously, this pressure will force the valve 57 to closed position as shown in Figure 11. The fluid then has no way except to escape through the apertures or passages 99 which effect communication between the axial passage 84 and the annular cavity with which the passages 86 communicate, as shown particularly in Figures 11 and 17. The arrows in Figure 11 show the flow of the liquid upon the down stroke of the plunger 68. The fluid thus displaced enters the annular chamber 55 defined by the shell 54 and as shown in Figure 10, enters the pump barrel 51 through the slots 100, after which it rises into the tubing assembly 50. The fluid last referred to commingles with the fluid which has been displaced on the down stroke of the plunger through the hollow stem 65, plunger 68, passages 101 in the plunger as shown in Figure 10, into the pump barrel 51 thence through the standing valve assembly 72.

From the foregoing it will be seen that effective displacement is had both on the down as well as the up stroke of the plunger, making for greater capacity and more efficient operation.

The fact that the pump is provided with means by which the pump rod assembly 60 may be connected and disconnected to the plunger stem 65, enables the pump to be constructed with concentric chambers of greater diameter than the tubing string and this fact combined with the fact that larger and sturdier valves may be employed adds much to the capacity and effective operation of the apparatus.

Manifestly, the construction shown is capable of considerable modification and such modification as is considered within the scope and meaning of the appended claims is also considered within the spirit and intent of the invention.

What is claimed is:

1. A well pump including in combination with a tubing and pump rod assembly, a working barrel having a hollow plunger therein suspended by said rod assembly and having fluid passages communicating with the upper portion of said barrel, a shell surrounding said barrel defining an annular fluid chamber in communication with said barrel at a point above the operative range of said plunger, a fluid receiving chamber below said plunger, means to effect communication between said plunger and said latter chamber, a compression valve in said latter chamber to effect elevation of fluid through said plunger on one stroke of said plunger, means to elevate fluid into said barrel below said plunger on another stroke thereof preparatory to its transfer into said concentric chamber and separate valve means in control of the fluid in its separate courses.

2. A well pump including a working barrel and a hollow plunger, a shell surrounding said barrel defining an annular chamber having communication therewith, a fluid receiving chamber supplying fluid to said barrel and said annular chamber, a compression plate therein containing gravity and pressure controlled valves, tubular means effecting physical and fluidal communication between said plate and plunger, separate valve means in control of the elevation of fluid through said tubular means and exteriorly thereof upon each cycle of operation of said plunger to effect re-association of fluid in said tubing assembly for ascension therein.

3. A well pump including a working barrel and a hollow plunger therein having fluid passages, a shell surrounding said barrel defining an annular chamber in communication with said barrel above and below said plunger, a fluid receiving chamber below said plunger having fluid passages extending into said annular chamber, means in said receiving chamber and actuated by said plunger to effect upward passage of fluid into and through the fluid passages therein and valve means in control of fluid rising through said plunger and said annular chamber.

4. A well pump including a body comprised of concentrically arranged tubular members defining an annular chamber and a working barrel and an annular chamber in communication therewith adjacent either end thereof, a fluid receiving chamber suspended below said annular chamber and having passages effecting communication with said annular chamber, a hollow plunger in said working barrel having fluid passages connecting its interior with the barrel thereabove, a tubular element depending from said plunger into said fluid receiving chamber and carrying a valved plate arranged to expel fluid from said latter chamber through said tubular element when said plunger is actuated, valve means in control of the fluid above and below said plunger and means for diverting fluid elevated through the interconnecting passages between said receiving and annular chambers for re-association with that elevated through said plunger.

5. A well pump including a working barrel and a hollow plunger therein, an annular chamber surrounding said barrel and having communication therewith above and below said plunger, a chamber below said barrel for receiving fluid from said well and having communication with said annular chamber, a valved plate reciprocably arranged in said receiving chamber, tubular means connecting said plate with said plunger whereby to expel fluid from said chamber through said plunger when the latter is actuated, and valve means in control of the fluid elevated in separate streams interiorly and exteriorly of said plunger.

6. A well pump including a body of concentrically arranged tubular elements, suspended by a well tubing assembly and defining a working barrel and an annular chamber, a hollow, reciprocable plunger in said working barrel, means effecting communication between said working barrel and annular chamber above and below said plunger, a perforated chamber below said body for receiving fluid from said well, means in said perforated chamber for expelling fluid therefrom for elevation through said plunger and valve means above and below said plunger for passing and holding said fluid in suspension.

7. Apparatus for elevating fluid from wells comprising a tubular body constructed to define a working barrel and an annular chamber, the latter communicating with said working barrel adjacent either end thereof, a chamber below and communicating with said annular chamber for initially receiving fluid from said well, a plunger having a fluid passage therethrough, carrying

means for forcing fluid upward from said receiving chamber, to pass axially through said plunger on one stroke thereof, means actuated simultaneously for diverting fluid into said annular chamber, rising from said receiving chamber exteriorly of said plunger.

8. Apparatus for pumping fluid from wells comprising a working barrel and a hollow plunger therein, a chamber suspended below said barrel for receiving fluid from the well, a valved plate therein, a tubular element connecting said plate and plunger whereby to be effective in forcing fluid from said chamber upward through said tubular element on one stroke of said plunger, a valve in said tubular element, valves above and below said plunger, and means surrounding said barrel, communicating with said barrel and receiving chamber into which a separate stream of fluid is diverted for re-association with said first mentioned fluid by alternate strokes of said plunger.

9. Apparatus for pumping fluid from wells comprising a working barrel and a hollow plunger therein, a chamber suspended below said barrel for receiving fluid from the well, a valved plate therein, a tubular element connecting said plate and plunger whereby to be effective in forcing fluid from said chamber upward through said tubular element on one stroke of said plunger, a valve in said tubular element, and valve means above and below said plunger for suspending the column of fluid elevated by said plunger.

10. A well pump including a pump barrel and a hollow plunger, a shell surrounding said pump barrel and defining an annular fluid chamber, means effecting communication between said annular fluid chamber and said pump barrel above and below said plunger, a valve chamber, a fluid receiving chamber communicating with said annular chamber through said valve chamber, valve means to admit fluid into said valve chamber preparatory to transferring said fluid to said annular chamber upon reverse action of said plunger and means also actuated by said plunger to force fluid from said receiving chamber through said plunger to be re-associated with said first mentioned fluid above said plunger and valve means above and below said plunger for suspending the column of fluid elevated by said plunger.

11. A well pump including in combination with a tubing assembly, a pump barrel and a hollow plunger, an annular chamber surrounding said barrel and having communication with said tubing assembly, a perforated chamber below said annular chamber for receiving fluid initially from said well, a valve chamber into which fluid is initially drawn by suction created by said plunger preparatory to transferring the same to said annular chamber and said tubing assembly upon reverse movement of said plunger, means within said receiving chamber for forcing fluid upward when said plunger is actuated and tubular means connecting said latter means with said plunger through which fluid is passed through said plunger to be associated with fluid entering said annular chamber in said tubing assembly.

12. In a well pump as described in claim 10, said valve means comprising a displaceable shouldered and cylindrical body having axial and radial fluid passages, each being in intermittent communication with fluid inlet and outlet passages to effect passage and retention of fluid as said body changes positions.

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