

R. E. CARMICHAEL.
 MEANS FOR PREVENTING CLOGGING OF THE WORKING BARRELS OF PUMPS.
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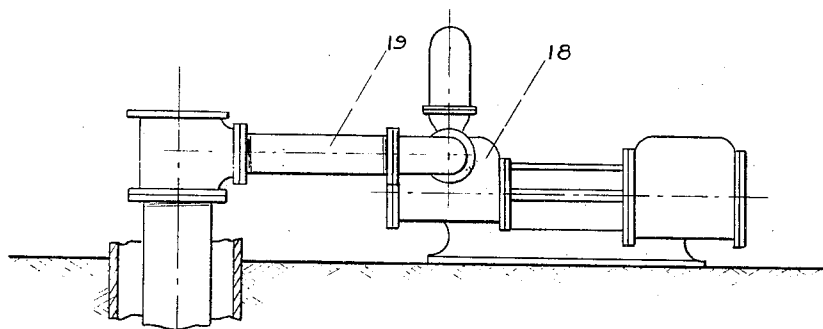


Fig 1

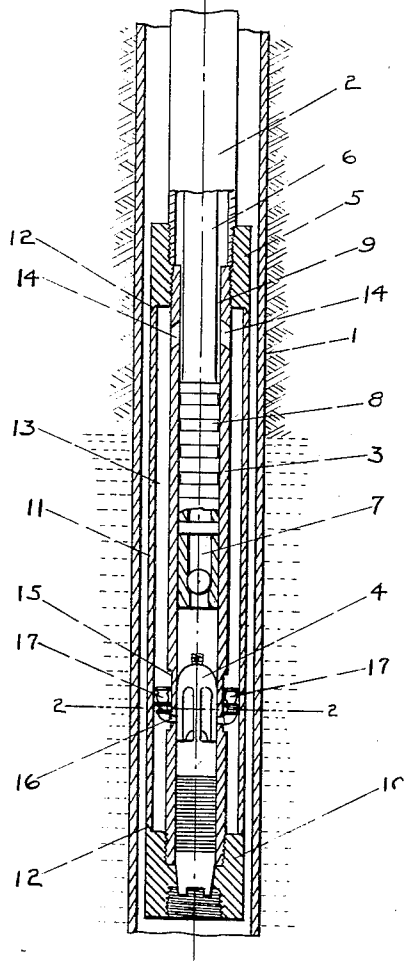
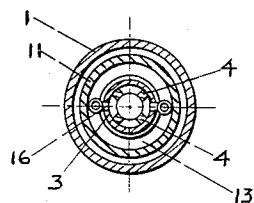


Fig 2



R.E. Carmichael, Inventor

By his Attorney

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MEANS FOR PREVENTING CLOGGING OF THE WORKING BARRELS OF PUMPS.

1,246,543.

Specification of Letters Patent.

Patented Nov. 13, 1917.

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To all whom it may concern:

Be it known that I, ROBERT E. CARMICHAEL, a citizen of the United States, residing at Damon, Brazoria county, Texas, have invented a certain new and useful Means for Preventing Clogging of the Working Barrels of Pumps, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to pumping apparatus for wells and the object of the invention is to provide a method of preventing clogging of the working barrel of the pump with sand or other sedimentary matter so that continuously satisfactory operation of the pump is insured, and means whereby this method is carried into effect.

It frequently happens in using deep well pumps that the water-bearing strata from which water is being drawn contain considerable quantities of quick-sand or other loose particles or sediment. In such cases the sand or sediment passes into the working barrel during operation of the pump and tends to accumulate, particularly in the neighborhood of the valves, and thus clog the working barrel so as to prevent effective use of the pump and even to completely shut off the flow of water. Upon such clogging of the working barrel it has heretofore been necessary to remove the pump rod and plunger in order to break up these sand accumulations and permit of renewed operation of the pump, or even, in those cases in which the pump rod and plunger could not be removed, to withdraw the entire pump casing in order to dislodge the obstruction.

It was to remedy these defects in existing pump structures that I devised the method and mechanism forming the subject matter of this invention.

In carrying out my invention I provide mechanism in connection with the pump for so introducing fluid under pressure into the working barrel during working strokes of the pump, that the accumulation of sand or other sedimentary deposits obstructing the working barrel and valves therein is entirely prevented and so that clogging of these parts cannot take place. And this mechanism is so arranged that back-flow of fluid from the working barrel is entirely prevented. Thus effective operation of the pump is at all times insured.

Further objects and the novel features of

my invention will be apparent from the following description taken in connection with the drawings in which:

Figure 1 is a side elevation of sufficient of my pump apparatus to illustrate its principle of operation, certain parts being in section and certain other parts being broken away in order to more clearly disclose its mechanical structure.

Fig. 2 is a cross-sectional view on the line 2-2 of Fig. 1.

Referring to the drawings 1 designates a well casing which extends to any suitable depth into the earth and receives a pump casing 2 of any well known or usual construction. Attached to the lower end of the pump casing is a working barrel 3, at the lower end of which is a standard foot valve 4 of the ball type, the pump casing and working barrel being held in properly connected relation by means of an internally threaded collar 5. Inclosed within the pump casing 2 is a hollow pump rod 6, having at its lower end a conventional plunger or suction valve 7. Arranged upon the outside of this plunger and near the lower end thereof are washers 8, adapted to make a tight fit between the plunger and the inside of the working barrel. The diameter of the pump rod 6 is such that a substantial space exists between that part of the pump rod above the washers 8 and the inner wall of the working barrel, as shown at 9.

In some localities those strata from which water is being pumped contain a considerable quantity of quick-sand which finds its way along with the water into the working barrel and tends to clog the working barrel and valves therein so as to prevent effective operation of the pump. When such an accumulation occurs it is necessary that the pump rod and plunger be removed in order to break up the deposits and thus permit of further effective use of the pump. And in those pumps in which the structure is such that the pump rod cannot be removed the entire casing along with the pump rod must be withdrawn in order to eliminate these troublesome deposits. This entails considerable expense along with loss of time and trouble, and it was to prevent the occurrence of these troublesome accumulations or deposits that I devised my present invention. In order to prevent these deposits I introduce some fluid under pressure into the working barrel in the immediate neighbor-

hood of the foot valve. As the fluid under pressure I may use water, oil, steam or air, but under ordinary circumstances I prefer to use water, and, unless so stated, all references herein to the fluid under pressure will refer to water. This fluid under pressure is introduced into the working barrel continuously during upward, or working, strokes of the plunger through passages which deliver the fluid directly into the foot valve in jets. These jets are introduced substantially at right angles to the direction of flow of the water passing through the foot valve, and effectively prevent the accumulation of any sand deposit in the foot valve. The passages through which this fluid under pressure is introduced into the working barrel are so controlled that back-flow of fluid from the working barrel thereinto is prevented and thus choking of these passages is impossible. The mechanism whereby I carry this method into effect is clearly illustrated in the drawings and is described below.

Arranged upon the lower end of the working barrel is an internally threaded sleeve 10. Surrounding the working barrel is a liner 11, which is substantially greater in diameter than the working barrel so as to leave a considerable space between the inner wall of the liner and the outer wall of the working barrel when the two are in assembled position. This liner is held in place by means of the threaded collars 5 and 10, each of which has a beveled wall 12 thereon, which coöperates with correspondingly beveled ends of the liner so that proper tightening of the sleeves 5 and 10 results in binding the liner 11 in place with the joints at each end tightly closed, to thus make the space 13 existing between the liner and the working barrel capable of acting as a container for fluid under pressure. At one end of the working barrel near the upper end of the liner are several ports 14 which connect the space 9 with the space 13. At the other end in the immediate neighborhood of the foot valve 4 the working barrel is cut away upon its outside as at 15 and leading through this cut-away portion are passages 16 which connect the space 13 with the interior of the working barrel, the said passages opening directly into the foot valve 4 and being so arranged that fluid delivered therethrough passes into the working barrel in jets moving in a direction substantially at right angles to the direction of flow through said working barrel. Inserted in these passages 16 are check valves 17 of standard form, which valves are so arranged as to permit of the passage of fluid from the space 13 into the working barrel but prevent a reverse flow.

Located upon the surface of the ground in convenient proximity to the upper end

of the pump casing 2 is an auxiliary pump 18 of any standard design, the delivery pipe 19 of which pump is connected with the interior of the pump casing 2. It is, of course, understood that various other mechanism is necessary for the operation of the pump rod 6 and for leading off the fluid passing through such pump rod, but such mechanism has not been illustrated inasmuch as it forms no part of my present invention but can be of any conventional design.

The operation of the device is as follows:

The auxiliary pump 18, which is in connection with any suitable source or supply of water free from sand or sediment, and which source or supply is not illustrated inasmuch as it forms no part of the subject matter of this invention and may be any tank or pond or stream of clear water, is started and water pumped thereby through the pipe 19 into the casing 2. This water passes from the casing 2 into the space 9 at the top of the working barrel, and from thence through the ports 14 into the space 13. The height of the column of water in the space 13 and in the pump casing 2 is such that the pressure of this water upon the check valves 17 about equals the upward pressure tending to force water through the foot valve 4 during suction strokes of the plunger or suction valve 7. The exact height of the column of water to be used can be readily determined during operation of the pump from the nature of the fluid delivered, and, of course, the pressure should vary, according to the sand content of the water being pumped, the depth at which the pump is operating, etc. And during the operation of the pump the auxiliary pump 18 continues to supply water to the inside of the liner 11 at such rate as to insure a constant pressure therein. It is evident that upon upward or suction strokes of the plunger valve 7 water will flow into the working barrel through the foot valve 4. This water it is which carries therein sand. At the same time the check valves 17 will open and allow an inflow of water from the space inside the liner 11. This water is delivered into the foot valve cage in jets, substantially at right angles to the direction of flow through the foot valve, which pass directly into the inflowing stream of water and sand and prevent the accumulation of any sand into deposits. Upon downward strokes of the plunger or suction valve the foot valve is, of course, closed and the water in the working barrel passes up through the suction valve above the ball valve therein. At such time there is also a tendency to force the water through the passages 16 back into the liner, but such back-flow is prevented by the check valves controlling these passages.

It is evident from the above description that I have devised a thoroughly effective

method of preventing the accumulation of sand deposits with consequent clogging of the working barrel and valves therein. And that I have also devised a thoroughly effective apparatus for carrying out that method. For by the use of my invention the accumulation of deposits is prevented and thus all trouble is avoided which might arise if these deposits are allowed to form and must then be broken up after such formation.

It is, of course, to be understood that any suitable means for introducing fluid into the liner space other than the pump illustrated may be used if desired, and that my invention is not limited to the use of such a pump as illustrated.

It is further to be understood that this invention is by no means limited to use in connection with water pumps; but is just as effective in oil pumps as in those for raising water. Further, it is useful in any place in which a fluid bearing sand or other sediment is being pumped, and in which clogging of the pumping apparatus might result. For instance, in suction dredges, as at present constructed, clogging inevitably results if operation is suspended; but the use of my invention in connection therewith would entirely prevent such clogging, would insure effective operation at all times, and would thus bring about a great saving in expense, time and labor.

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

1. The method of preventing clogging of the working barrel of a pump, consisting of providing passages leading into the said working barrel, of connecting said passages to a source of fluid under pressure and of so controlling said passages that the fluid under pressure is continuously introduced to the working barrel during each working stroke of the pump.

2. The method of preventing clogging of the working barrel of a pump, consisting of providing passages leading into said working barrel, of connecting these passages to a source of fluid under pressure and of so controlling the passages that the fluid under pressure is introduced into the working barrel only during working strokes of the pump while back-flow through the passages is at all times prevented.

3. The method of preventing clogging of the working barrel of a pump, consisting of providing passages leading into said working barrel, of connecting these passages to a source of fluid under pressure, and of automatically controlling the passages so that the fluid under pressure is delivered into the working barrel only during working strokes of the pump.

4. In a pump, the combination of a work-

ing barrel, a foot valve therein, a suction valve above the foot valve, and means to automatically deliver fluid under pressure into and through the foot valve during upward movement of the suction valve.

5. In a pump, the combination of a working barrel, a foot valve therein and means to automatically deliver auxiliary fluid into the foot valve only during working strokes of the pump.

6. In a pump, the combination of a working barrel, a foot valve therein, a passage through the wall of the working barrel, and means to automatically admit fluid under pressure through said passage and into the foot valve only during working strokes of the pump.

7. In a pump, the combination of a working barrel, a foot valve therein, a passage through the wall of the working barrel, a valve in said passage adapted to automatically admit fluid under pressure through said passage and into the foot valve during working strokes of the pump.

8. In a pump, the combination of a working barrel, a liner spaced from and surrounding the working barrel and carried thereby, said liner being adapted to receive a fluid under pressure, a passage connecting the space within the liner with the interior of the working barrel, a valve in said passage to admit the fluid under pressure therethrough and into the working barrel during working strokes of the pump.

9. In a pump, a working barrel, a foot valve therein, a liner spaced from and surrounding the working barrel and carried thereby, said liner being connected with a source of fluid under pressure, passages connecting the space within the liner with the interior of the working barrel, valves in said passages, the passages and valves being so arranged as to admit the fluid under pressure into the foot valves during working strokes of the pump.

10. In a pump, a working barrel, a foot valve, a liner spaced from and surrounding the working barrel and carried thereby, a plunger inside the working barrel, passages connecting the space within the liner with the interior of the working barrel adjacent to the foot valve, valves in said passages, the space within the liner being connected with a source of fluid under pressure, and the valves in the passages being so arranged as to deliver such fluid therethrough into the foot valve during working strokes of the plunger.

11. In a pump, a working barrel having a foot valve, a liner spaced from and surrounding the working barrel and carried thereby, a plunger inside the working barrel, means for continuously applying fluid under pressure to the space within the liner, and means for delivering this fluid into the foot

valve during working strokes of the plunger.

12. In a pump, the combination of a working barrel, a foot valve therein of the caged ball type, a liner spaced from and surrounding the working barrel and carried thereby, means for supplying fluid under pressure to the space within the liner, a passage leading from the said space into the working barrel, a valve controlling the passage and arranged to automatically deliver the fluid under pressure into the working barrel through the foot valve cage during the working strokes of the pump.
13. In a pump, a working barrel having a foot valve, a liner spaced from and surrounding the working barrel and carried thereby, means for supplying fluid under pressure to the space within the liner, a passage leading from said space into the working barrel, a valve in the passage arranged to automatically deliver the fluid

under pressure into the working barrel in the immediate neighborhood of the foot valve during working strokes of the pump, and to prevent flow of fluid from the working barrel to the liner space at all times.

14. In a pump, a pump shaft, a hollow pump rod working therein, a collar on the end of said shaft, a working barrel connected at its upper end to said collar, a second collar threaded to the lower end of said barrel, beveled shoulders on the adjacent peripheral edges of said collars, a barrel-shaped liner between said beveled shoulders, and adapted to be securely clamped in place surrounding said working barrel, and a valve-operated passage from said liner to said barrel to admit fluid under pressure thereto on the working stroke of the pump.

In testimony whereof, I hereunto affix my signature this 25th day of January, 1917.

ROBERT E. CARMICHAEL.