Feb. 7, 1933. H. W. PARKIN 1,896,719

PUMP BARREL AND PLUNGER

Filed July 5, 1928

Fig. 1.

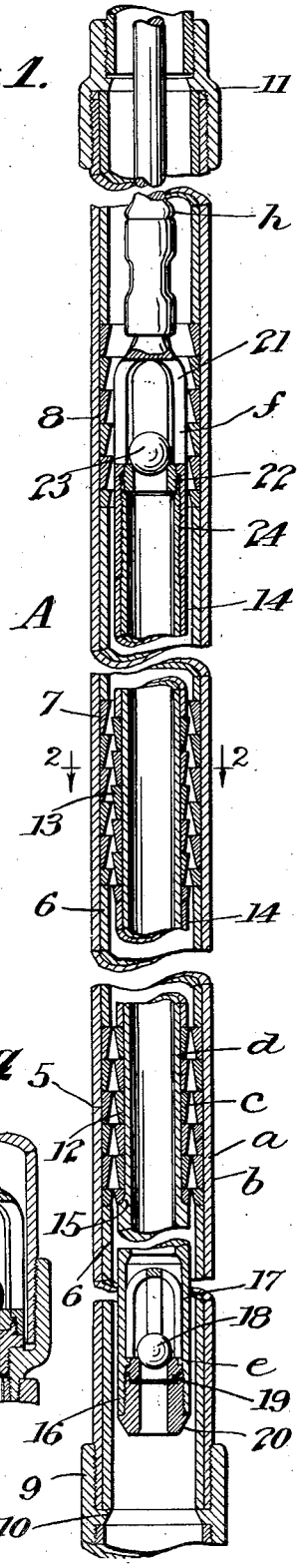
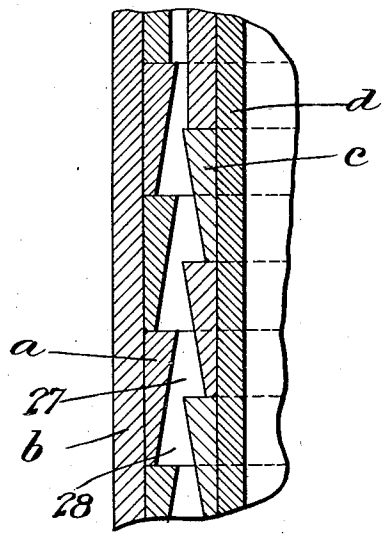


Fig. 1a

Fig. 3.



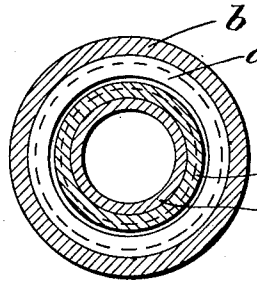


Fig. 2.

Fig. 5.

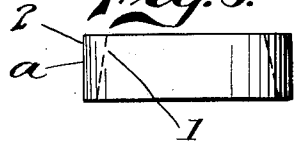
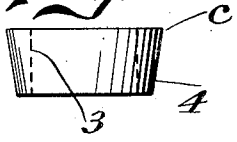


Fig. 4.



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UNITED STATES PATENT OFFICE

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PUMP BARREL AND PLUNGER

Application filed July 5, 1928. Serial No. 290,298.

This invention relates to pumping barrels, and more particularly to a novel arrangement wherein a plunger may operate within a working barrel in such a manner that a tight fluid seal exists between the barrel and plunger without any working surface contact between said barrel and plunger.

Another object is the provision of a device so formed and constructed as to readily work in low gravity oils, such as tar oils, and oils highly affiliated with sand in an efficient manner and without the usual sanding up.

Another object is the provision of a pumping system and means which will operate under the most adverse conditions without the necessity of having to pull the pump and which system and means so functions as to allow the same to be readily cleaned within the well.

Other objects of the invention will appear as the specification proceeds, as well as different uses and embodiments of the invention not specifically set forth, and which embodiments are contemplated, and with the above named and other objects in view, the invention consists in the novel and useful provision, formation, constuction, association, and relative arrangement of parts, members, and features, all as shown in a certain embodiment in the accompanying drawing, described generally, and more particularly pointed out in the claim.

In the drawing:

Figure 1 is a longitudinal sectional view of the invention,

Figure 1ª is a longitudinal sectional view of a standing valve, such view forming a continuation of Figure 1,

Figure 2 is a cross-sectional view on the line 2—2 of Figure 1,

Figure 3 is an enlarged detail sectional view of a portion of the invention, and

Figures 4 and 5 are elevations of members of the invention.

Referring now with particularity to the drawing, the improved invention is designated as an entirety by A, and the same includes means *a* adapted to be received within a barrel *b* and to cooperate with said barrel; means *c* cooperating with a plunger *d*, all of which elements may be used in practicing one embodiment of the invention. In particular the said means *a* illustrated in Figure 5 comprises a member formed with a conical bore 1 and a uniformly curved outer surface 2. Means *c* is ring like in formation, and provided with a uniform central bore 3, and the outer surface 4 is inclined or conical in form. In the present instance, the taper or bore 1 of the means *a* has the same slant or angle of slant as the outer surface of the means *c*. For convenience of description, the means *a* will be hereinafter termed a liner ring, and the means *c* a plunger ring. The liner rings are fitted within the barrel *b*, and one or more thereof, as shown at 5, may occupy a selected zone within said barrel. Within said zone 5 are five of said rings and said rings are held in position within the barrel by means of barrel liners 6. In the present instance, I have provided groups of liner rings at other zones of said barrel, as shown at 7 and 8, with said groups separated by liners 6. Said rings are arranged one upon the other in such a manner that the bore 1 thereof converges upwardly, as shown in Figure 1. The lowermost liner 6 is held in position by means of the coupling 9, which is screw-threaded at the lower end of the barrel *b*, it being noted that the coupling is provided with the usual internal flange 10 to accommodate ends of said liner and the barrel. The upper end of the barrel likewise secures the coupling 11 which accommodates the upper end of the barrel and the topmost barrel liner, the relation being such that when the couplings are in position, the liners closely hold the several groups of liner rings together. The plunger rings *c* are upon the periphery of the plunger *d* and as in the case of the liner rings. Said plunger rings are likewise arranged in groups at different zones of said plunger, as shown at 12 and 13, and which plunger ring groups are separated by sleeves 14. The said plunger is shouldered at 15 to accommodate for the lowermost plunger ring in zone 12 and said plunger is internally screw-threaded at 16 to accommodate the bottom valve *e*. This bottom valve is conventional in form, including the usual crown 17, ball 18, seat 19 for accom-

modating the ball, and nut 20, all of which members aforesaid are held in working relation, as shown. A top working valve *f* is provided which is secured to the uppermost end of the plunger and the same includes the usual crown 21, seat 22, and ball 23 cooperating with the seat. The uppermost sleeve 14 and the plunger are screw-threaded together at 24 and the sleeves 14 are so arranged as to hold the several plunger rings in close cooperative arrangement upon the plunger. The coupling 9 is adapted to secure the tube 25, which tube in turn carries a seat coupling 26, which seat coupling is adapted to secure the standing valve *g*. The standing valve is conventional in form and is similar to the valves *e* and *f*. Pump rods *h* are secured to the crown 21 of the valve *f*. It will be noted upon reference to Figures 1 and 3 that the plunger which will include its associated members *c*, has moved within the barrel and its associated members *a* to a position where the zone 12 of the members *c* and the zone 5 of the members *a* are in substantially side by side relation with the top and bottom surfaces thereof in alignment. The space included between each cooperating member *a* and *c* is annular in nature and presents a greater space area at one end than adjacent the opposite end or what would be the apex, it being noted that this space would approximate an isoceles triangle, considering a cross section of the device as shown in the figures. The group of the rings *c* in the zone 13 are in zigzag or staggered relation with respect to the group of rings *a* shown in zone 7. This relation just described is shown in enlarged cross section in Figure 3. It is thus evident that when the plunger is in movement within the barrel that the open area that might exist between the members *a* and *c* increases and diminishes. It is evident upon reference to Figure 3 that the areas indicated at 27 and 28 are substantially equal and further that as the plunger moves upwardly that portion 27 would diminish as to area, whereas the area 28 would increase and include that portion which was formerly 27. It is not intended by the above to indicate that there would ever be any variation in area between the members *a* and *c* because the area would at all times remain the same.

The operation, uses and advantages of the invention, although previously set out in the preamble, contemplate further a type of pump which is so constructed as to work well within formations that generally stop operation of a plunger after a certain period of use. The present invention will operate efficiently under most unfavorable conditions. When the device shown in Figure 1 is operating within oil sand, it is evident that the interior of the plunger will be filled with oil and that this plunger must operate within the oil. Oil will, of course, be received in the space included between the plunger and the barrel liner and a part of this oil will be received between the means *a* and *c*. When the lowermost zone 12 of the plunger ring *c* moves below the zone 5, oil may be received within the space between said rings and when the plunger commences its upstroke, the oil thus trapped is in a measure conveyed by the rings *c* upwardly and as a consequence the means *a* and *c* act as a pump for pumping oil upwardly within the oil tubing to the surface of the well. This arrangement will act both alone and in cooperation with the standing valve *g* and the lower and upper working valves *e* and *f* respectively. It is evident that the relation that exists between the means *a* and *c* is such as to at all times aid in the lifting of oil or other liquids which are received between the sleeve and the barrel. Furthermore, the relation between the means *a* and *c* is such as to prevent an effective seal against movement of oil in a downward direction, assuming the parts in the relation and position shown in Figure 1.

The device just described is so formed and arranged with respect to the rings utilized that there is no working surface contact between said rings. However, the arrangement is such that the plunger may operate within the barrel in oil affiliated with sand, tar oils, and all low gravity oils without impairment of operation.

In connection with sand, it is a known fact that when a pump is what is called "sanded up", it becomes necessary to pull the pump and wash it and at the same time the sand must be washed from the well, and if there is an over amount of sand, it is necessary to work the sand out before a plain barrel pump can be put back into operation. However, when sand is encountered with a pump of my design, the so-called saw-toothed surface or corrugated appearance presented by the different zones of liner rings and plunger rings, which corrugations it will be noted present right angled surfaces, these right angled surfaces function as conveyors and convey the sand upwardly during the stroke of the plunger. When the plunger returns within the barrel, the sand is sheared from the plunger by the right angled surfaces of the rings in the barrel. Results have shown by actual test that a pump constructed in accordance with this invention will efficiently pump a 70% sand affiliated with oil, and when the well has been relieved of the sand, the working barrel and plunger automatically cleans, due to discharge of liquid between the liner rings and plunger rings.

In arranging the different zones of liner rings and plunger rings, I have preferably so arranged the zones that when one zone is in registration, for instance the zones 5 and 12, as shown in Figure 1, that other zones for instance the zones 7 and 13 are out of regis-

tration. This means that the right angled surfaces do not lie in the same plane except in one zone. This arrangement is necessary in order that the liquid lock should not be so great as to impair the operation of the plunger within the barrel. The lifting of the liquid, whatever its nature, is executed by lifting the plunger which primes the barrel with the liquid and is locked by the foot valve and when the plunger is dropped, forms a pressure on the liquid which passes through the interior of the barrel and up between the corrugated surfaces and as these corrugated surfaces at different intervals increase and decrease the area existing therebetween in certain stages of the downward movement of the plunger within the barrel. The liquid has ample room to pass between the corrugations at a rapid rate due to the long angled surfaces contemplated by the periphery of the plunger rings and the inner surfaces of the liner rings, it being evident that there are no abrupt surfaces, namely, the right angled surfaces, when the plunger is moving downwardly within the barrel. Inasmuch as the barrel is primed, there will be oil both exteriorly of the plunger and interiorly of the plunger and when the plunger makes its upstroke, the right angled surfaces which exist between the rings, act to convey the liquid up the long taper or tapered surface of the rings, moving the liquid to the top of the barrel. The liquid is, of course, prevented from flowing backward due to the liquid seal that would exist at certain zones during the upward movement of the plunger, it being evident that as the liquid is lifted, the space therebehind is sealed, due to registration between the liner rings and plunger rings at zones below the zone of lift.

I claim:

A pump comprising a barrel, a plurality of superposed rings in the barrel forming corrugations therein, means securing said rings in the barrel, a plunger, a plurality of superposed rings on the plunger whereby the outer surface of the plunger is corrugated, and means to secure said last named rings on the plunger, a check valve on the top of said plunger, and a second check valve on the bottom of the plunger.

In testimony whereof, I have signed my name to this specification at Los Angeles California, this 15th day of June 1928.

HENRY W. PARKIN.