Aug. 7, 1928. 1,679,552

D. R. TRIPPLEHORN

PUMP FOR OIL WELLS

Filed July 25, 1927 2 Sheets-Sheet 1

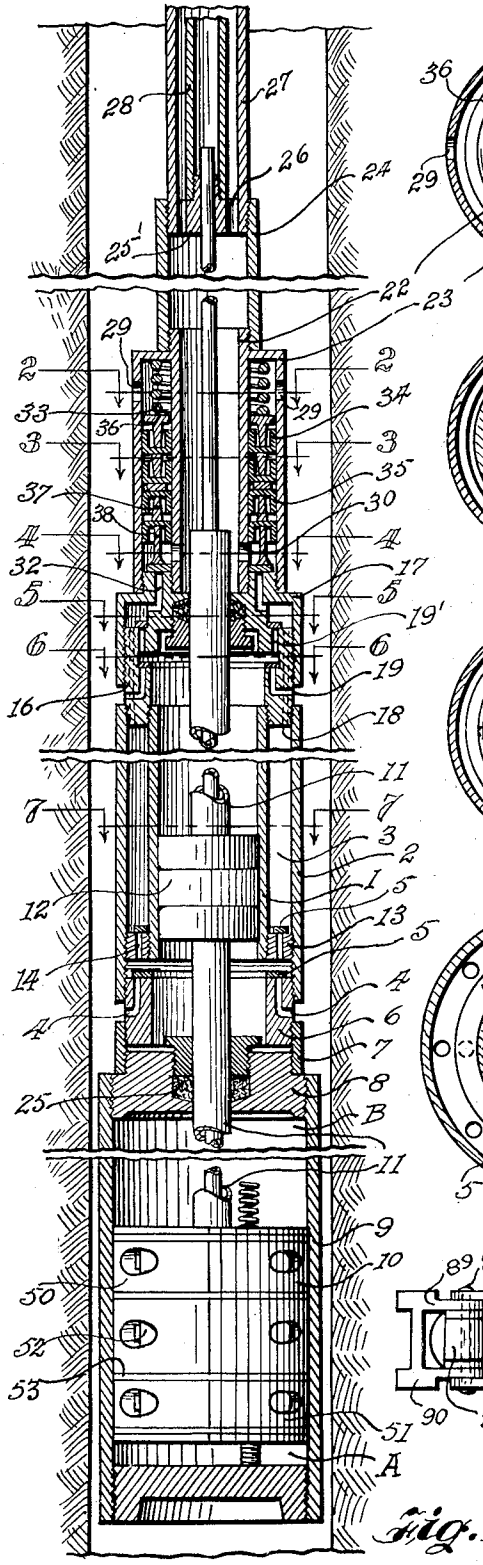


Fig. 1.

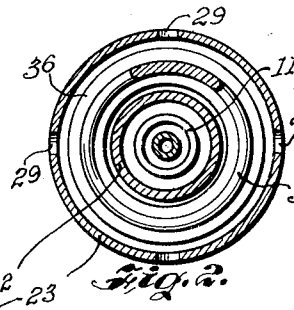


Fig. 2.

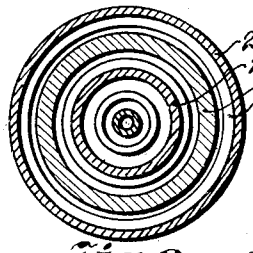


Fig. 3.

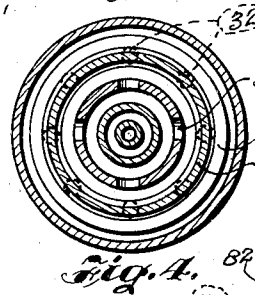


Fig. 4.

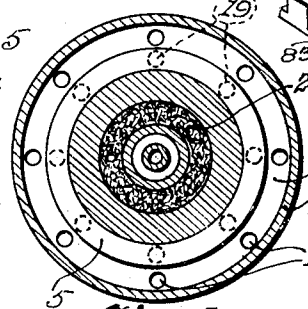


Fig. 5.

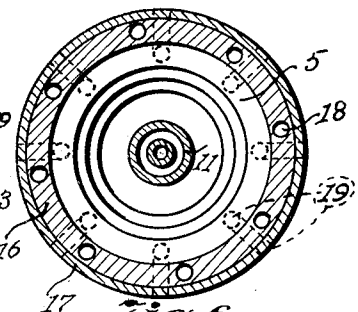


Fig. 6.

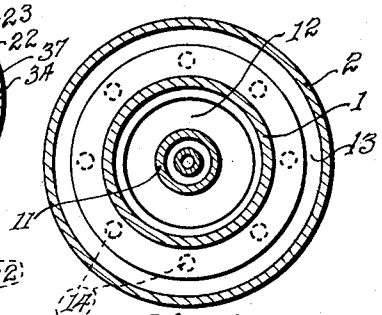


Fig. 7.

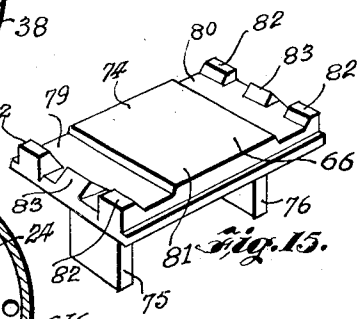


Fig. 15.

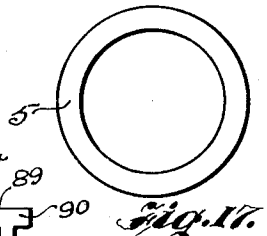


Fig. 17.

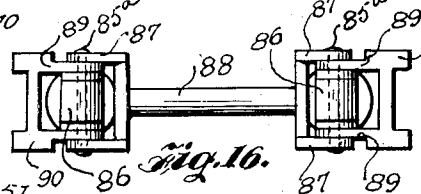


Fig. 16.

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D. R. TRIPPLEHORN

PUMP FOR OIL WELLS

Filed July 25, 1927 2 Sheets-Sheet 2

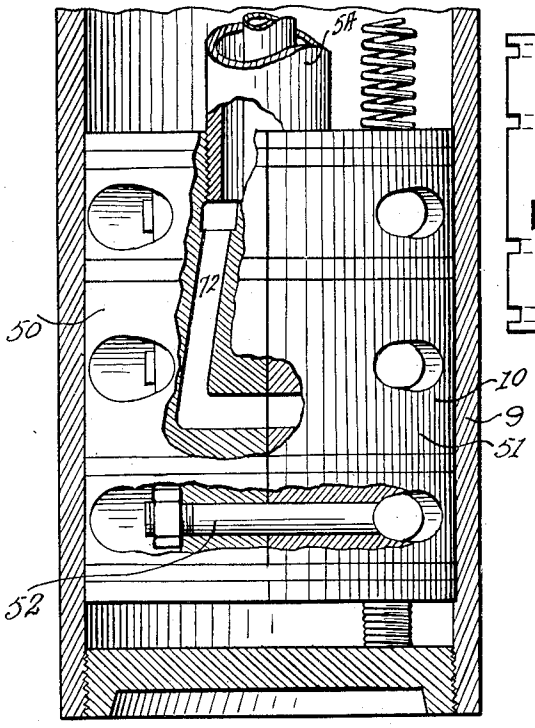


Fig. 8.

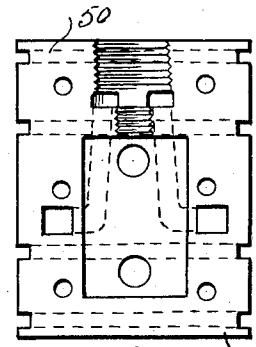


Fig. 9.

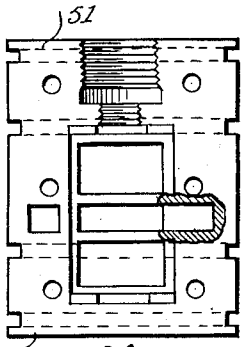


Fig. 10.

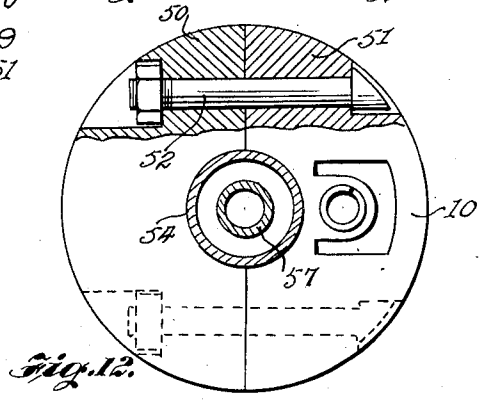


Fig. 12.

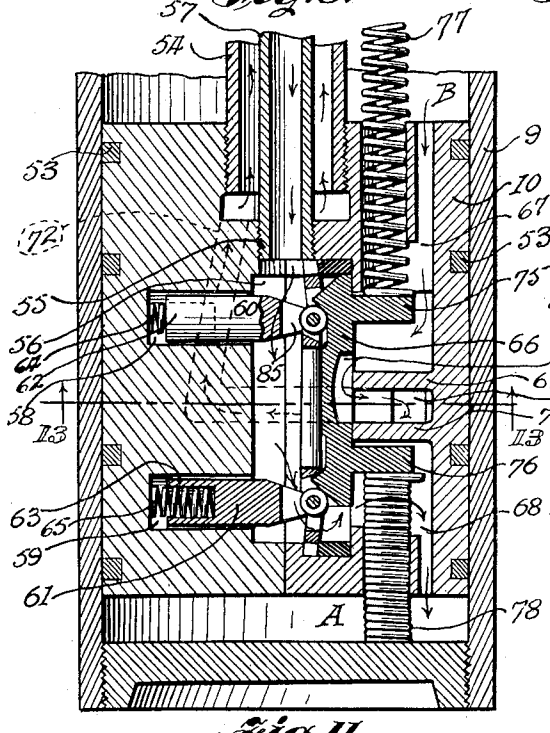


Fig. 11.

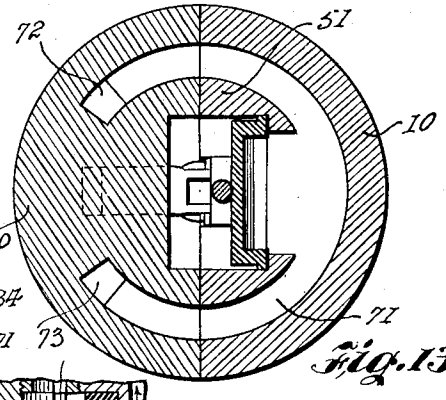


Fig. 13.

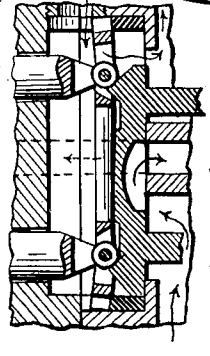


Fig. 14.

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UNITED STATES PATENT OFFICE.

DAVID R. TRIPPLEHORN, OF FORT WORTH, TEXAS.

PUMP FOR OIL WELLS.

Application filed July 25, 1927. Serial No. 208,233.

The invention relates to pumps of the pneumatic type for the removal or pumping of liquid from wells. My invention more particularly relates to the provision of a compressed air motor in connection with a pump of this nature, both motor and pump adapted to be built small enough to be positioned in their entirety, and to function, at the bottom of a well drilling, as deep as 4000 to 5000 feet, of relatively small diameter, 4 to 6 inches, as well as of larger ones, yet capable of maximum production of liquid for continuous periods, as long as the intake is covered with fluid, obtaining a valve displacement and resultant output many times greater than with the use of sucker rods.

My improved apparatus insures positive and continuous operation, eliminating entirely the possibility of "sticking" or "centering" of the motor, and consequent stoppage of the pumping, with its attendant loss both in expense and inconvenience of withdrawal from great depths, and examination, adjustment and possible repair and replacement of parts.

My construction permits of use of air pressure as low as 250 pounds in place of the 1500 pounds in present practice, eliminating the danger of splitting the tubing by high pressure, and my device is simple, compact, rugged in construction, durable, with practically no wear, and efficient in operation.

The various features of novelty which characterize my invention are pointed out with particularity in the claims, annexed to and forming a part of this specification, but for a better understanding of the invention, however, its advantages and specific objects attained with its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described the best forms of my invention.

Of the drawings:

Figure 1 is a vertical sectional view of both pump and valve mechanism, illustrated in operative position at the bottom of the well,

Figures 2 to 7 inclusive are cross-sectional views taken on lines 2 to 7 inclusive.

Figure 8 is an enlarged partial vertical sectional view of the cylinder and piston carrying the valve mechanism,

Figures 9 and 10 are opposite side views, on a reduced scale, of the piston carrying the valve mechanism,

Figure 11 is a view of Figure 8 showing the cylinder piston and valve in vertical section,

Figure 12 is a top plan view of Figure 11, the view partly broken away,

Figure 13 represents a cross-sectional view on the line 13—13 of Figure 11,

Figure 14 is a detail fragmentary sectional view of the valve,

Figure 15 represents a perspective view of the valve,

Figure 16 is a detail view in horizontal position of the rod and rollers which prevent the valve from assuming a negative central position, and

Figure 17 is a plan view of a ring used to open and close various oil ports.

In carrying out the invention there is provided a pump barrel having an inner wall 1 and an outer wall 2 thus forming an annular space 3, the oil entering through the ports 4, which are normally closed by a ring 5 shown in Figure 17 and used in several parts of the invention. The ring for ports 4 is supported on a member 6 which forms a connection between the barrel and an annular sleeve 7. The sleeve 7 in turn is connected to a head 8, the latter completing the connection between the barrel and the cylinder 9 in which is disposed the valve and its piston 10—referred to hereinafter.

In the pump barrel is a tubular rod 11 which carries a pump piston 12, the rod 11 being connected to the piston 10.

In the bottom of the pump barrel is seated an annular ring 13, see Fig. 7, having ports 14, which are likewise normally closed by a ring 5. The upward movement of the pump piston 12 will lift the rings 5 permitting oil to enter the pump barrel between its walls 1 and 2.

In the upper end of the pump barrel is seated a screw-threaded member 16 connected to a sleeve 17, see Figs. 5 and 6. The member 16 includes ports 18 and 19, the ports 19 opening outwardly to permit oil to enter the top of the barrel. Ports 18 and 19 are also normally closed by rings 5, the oil in its ascending stages passing from one ring to another.

Connected to the sleeve 17 and above the pump barrel is a tubular member having an inner wall 22 and an outer wall 23, the tops of the walls being closed as shown in Figure 1. The top of the pump barrel and the head 8 have each a packing gland 24 and 25

through which the tubular rod 11 reciprocates, as actuated by the piston 10 under air compression.

Connected to the inner wall 22 is a short length of tubing 24 including a closure 25' having ports 26, and a tubing 27 and a tubing 28 are connected to the tubing 24 and closure 25' and lead to the top of the well. The tubing 28 is for the purpose of admitting air under pressure to operate the valve mechanism while the tubing 27 forms a passage for the outward flow of the oil.

Referring again to the walls 22 and 23 of the tubular member connected to the pump barrel, the outer wall 23 includes ports 29 for entrance of oil between the walls. At the bottom of the wall 22 are ports 30 which allow the liquid to escape upwardly as brought up by the pump piston 12. The object of the ports 29 is for the purpose of equalizing the oil pressure as will be more fully explained hereinafter.

At the top of the member formed by the walls 22 and 23 is a spring 33, beneath which are a plurality of channeled rings 34 and 35, the rings 34 having their channels upwardly disposed, while the lower rings 35 are inverted. The spring 33 is rested upon a ring 36 which seats in the topmost ring 34. All the rings are spaced apart by the separators 37, the last separator 38 resting upon a ring which normally closes the ports 32.

Referring now to Figs. 8 to 17 inclusive, the air piston 10 is made up of two sections, 50 and 51, each preferably of substantially semi-cylindrical configuration, the sections being fastened together by bolts 52—52 and forming the piston, around which are rings 53—53 to enable the piston to tightly fit the cylinder 9.

The piston 10 is bored, as shown, a short way inward and screwthreaded to receive the exhaust pipe 54, the bore being reduced in diameter at 55 for a short distance and then slightly enlarged into a rectangularly shaped space, as at 56, and extended further inward but terminating short of the bottom of the piston, and is also threaded to receive the end of the air inlet pipe 57—see Fig. 11.

Into spaced recesses 58 and 59 formed in the inner wall of the section 50, are loosely positioned detent members 60 and 61, hereinafter explained, having their inner ends formed with sockets 62 and 63 to receive spiral springs 64 and 65, the ends of each spring engaging respectively the bottoms of the said recess and socket to urge the detent out of its recess.

Within that portion of the rectangular space 56 located in section 51, is positioned the valve 66, later referred to. In the section 51 are exhaust ports 67 and 68, separated by divisional formations 69 and 70 from the horseshoe shaped port 71, the ends of which communicate with the vertical ports 72 and 73, formed in the section 50, and leading upward into communication with exhaust pipe 54.

As shown in Fig. 15, the valve 66 comprises a body member 74 and lug members 75 and 76, adapted to project into the ports 67 and 68, to reciprocate the valve at proper times when actuated by the springs 77 and 78, positioned within inwardly extending bores in both ends of the piston 10. The body member 74 has grooves 79 and 80 formed between the smooth central portion 81 and the end lugs 82 and 83, each set of which comprises an inverted V or triangular shaped lug 83 positioned intermediate two flat-topped corner lugs 82. Approximately midway between the lug members 75 and 76, there is formed a recess 84, so that it will register with the ports 67, 68 and 71 for the passage of air.

Each of the detent members 60 and 61 has its outer end tapered, slotted as at 85, Fig. 11, and bored to receive a pintle 85[a] on which is journalled the roller 86, the arms 87 of the rod 88 and the arms 89 of the terminal extension spacing member 90 (see Fig. 16). As the springs 64 and 65 urge the detents outwardly, since the spacing between the lugs 83 on the valve 74 is the same as that between the rollers 86, the simultaneous engagement of the rollers with corresponding sides of the lugs 83 will hold the valve in its extreme position, either upward or downward, and it is obvious that the triangular configuration of the lugs 83 engaged by the spring pressed rollers, prevent the valve from assuming a negative central position.

The operation of the device is as follows: compressed air from the air pump enters through pipe 57, and passes in the direction of the arrows (Fig. 11) through the port 68 into the cylinder 9. The piston 10 will now move upward under pressure of air in the space "A", the free air in space "B" exhausting in the direction of the arrows through port 67 into exhaust ports 71 and 72 and upward into pipe 54.

As soon as the piston reaches the end of its upstroke, the spring 77 will come in contact with the cylinder head in space "B" to reverse the operation.

Particular attention is called to the action of the valve 74 as actuated by the springs 77 and 78, and as controlled by the spring pressed detent, rod and roller mechanism. The purpose of these members is not only to take up lost motion and permit a positive and quick operation of the valve, but in addition to positively prevent the valve from assuming a negative central position which would give rise to "centering" of the pump motor and effectually stop its operation.

As soon as the spring 77 comes in contact with the cylinder head, it exerts pressure on the lug 75 of the valve, and as soon as the

force exerted by the spring 77 exceeds the tension of the detent springs 64 and 65, the valve 74 will be moved downwardly, as the rollers, forced inwardly, ride over the apexes of the triangular lugs 83, and then ride down the opposite slopes to resiliently retain the valve in its new lower position. Compressed air will now pass into opening or port 67, thence into space "B", and the piston moved downward, exhaust air now passing through lower port 68 into exhaust ports 71 and 72 and upward into pipe 54. The lower spring 78 will reverse the operation on coming into contact with the bottom of the cylinder in space "A".

In the meantime, the pump piston 12, on its upward movement, has drawn in oil or other liquid through lower ports 4 and force it upwardly successively through ports 14, annular chamber 3, ports 18, ports 32, ports 30, tube 22, tube 24, into the delivery pipe 27. On the downward stroke of the piston the oil or liquid will be drawn into the pump barrel 1 through upper port 19 and force it out successively through upper ports 19', ports 32, ports 30, tube 22, tube 24, into the delivery pipe 27.

I claim:

1. A double acting pump comprising outer and inner barrels forming an annular chamber therebetween, a piston working in the inner barrel, an upper ring in threaded engagement with the upper ends of said inner and outer barrels, a lower ring in threaded engagement with the lower end of said outer barrel, an intermediate ring in threaded engagement with said outer barrel and the lower end of said inner barrel, said upper ring and intermediate ring forming closures for said annular chamber, an outlet pipe having communication with said outer barrel, said upper ring having valve-controlled openings providing communication between said annular chamber and said outlet pipe and between said inner barrel and said outlet pipe, said upper ring also having a valve-controlled inlet port effecting communication between said inner barrel and the exterior of said outer barrel, said intermediate ring having a valve-controlled opening providing communication between said inner barrel and said annular chamber, said lower ring having a valve-controlled inlet port effecting communication between said inner barrel and the exterior of said outer barrel, said piston having a piston stem passing through said upper ring and projecting into said outlet pipe, said piston stem having a portion thereof of larger diameter to act as a pump piston to assist the upward movement of the water in said outlet pipe.

2. A double acting pump comprising outer and inner barrels forming an annular chamber therebetween, a piston working in the inner barrel, an upper ring in threaded engagement with the upper ends of said inner and outer barrels, a lower ring in threaded engagement with the lower end of said outer barrel, an intermediate ring in threaded engagement with the said outer barrel and the lower end of said inner barrel, said upper ring and intermediate ring forming closures for said annular chamber, an outlet pipe having communication through an intermediate chamber with said outer barrel, said upper ring having valve-controlled openings providing communication between said annular chamber and said intermediate chamber and between said inner barrel and said intermediate chamber, said upper ring also having a valve-controlled inlet port effecting communication between said inner barrel and the exterior of said outer barrel, said upper ring also having a valve-controlled opening between said intermediate chamber and said outlet pipe, said intermediate ring having a valve-controlled opening providing communication between said inner barrel and said annular chamber and said lower ring having a valve-controlled inlet port effecting communication between said inner barrel and the exterior of said outer barrel.

In testimony whereof I affix my signature.

DAVID R. TRIPPLEHORN.