April 21, 1931. W. F. McMAHON 1,801,520

OIL WELL PUMP

Filed July 26, 1928

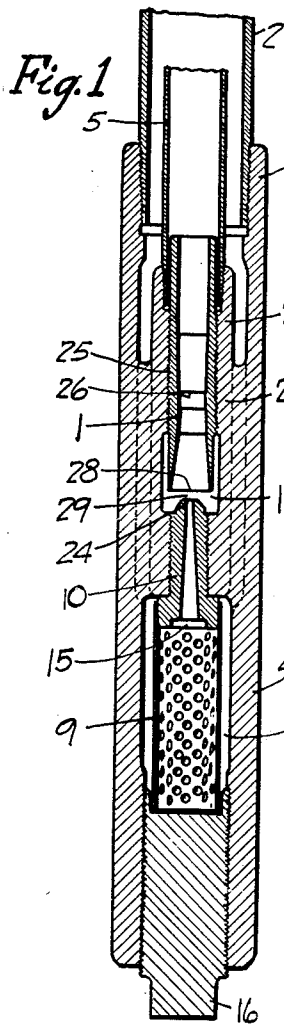


Fig. 1.

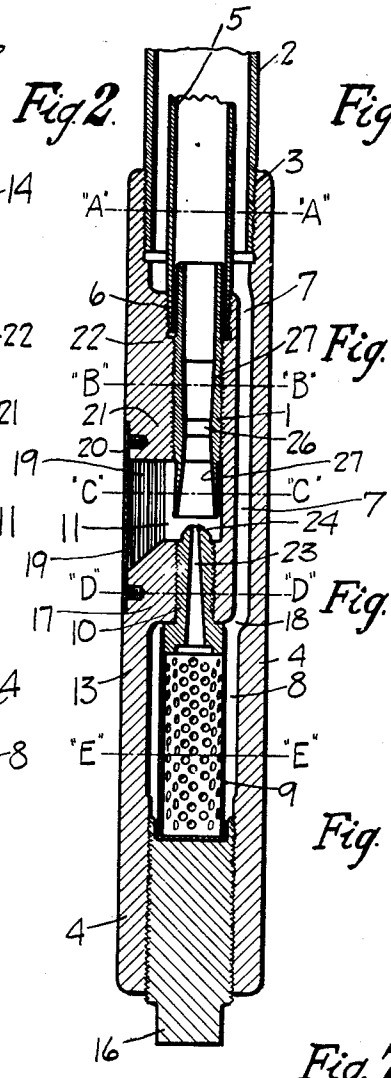


Fig. 2.

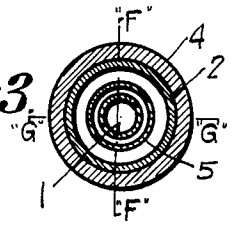


Fig. 3.

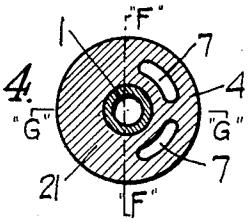


Fig. 4.

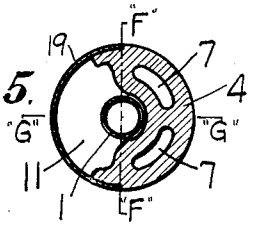


Fig. 5.

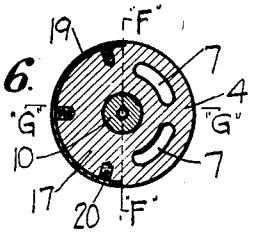


Fig. 6.

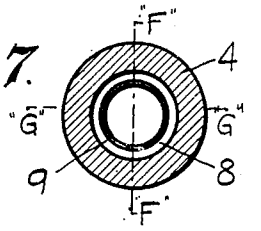


Fig. 7.

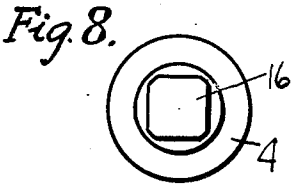


Fig. 8.

INVENTOR.

William Frederick McMahon

Patented Apr. 21, 1931 1,801,520

UNITED STATES PATENT OFFICE

WILLIAM FREDERICK McMAHON, OF RIVERSIDE, CALIFORNIA

OIL-WELL PUMP

Application filed July 26, 1928. Serial No. 295,606.

This invention relates in general to an oil well pump and relates more specifically to a new and novel ejector apparatus for raising liquids or fluids.

An object of the invention is to provide a simple efficient means for utilizing a continuous flow of fluid (substantially identical with the fluid to be moved) as a motor medium for raising fluid or the like from a bored hole or the like in the earth.

Another object is to provide a pumping means with a nozzle and a venturi, the entrance to the venturi, adjacent the nozzle tip, being unobstructed by a check valve and in the compartment, of the device, having access to the oil deposit in the bored hole or the like in the earth.

A further object is to provide a pumping device with a nozzle and a venturi that will be operated by a liquid, the tip of the nozzle and the adjacent opened end of the venturi being located in a compartment which has free access to the oil deposit through the side walls of the device and said device having no check valves or valves of any type.

Another object is to provide a pumping device comprising a nozzle and a Venturi means, both of which can be assembled in the said device or removed from the said device in axial alignment with the device.

Another object is to provide a pumping device that will be operated by a liquid and comprising a nozzle and a venturi, the entrance to the said nozzle being in a chamber and encased by a screen located in the said chamber, the said chamber being encased by solid side walls in the device.

As it is known, the present plunger pumps for oil wells are very inefficient due to the gas in the oil deposit and the sand content in the oil, and nozzle pumps operating with air are impractical in raising oil containing a relatively high percentage of water because the air under a high velocity emulsions the liquid. Also in an ejector pump it is impossible to lift a check valve due to the high pressure caused by the head of liquid in the pump. My present improvement overcomes all of the objectionable features heretofore encountered and by using a liquid as a motive fluid coupled with a simple construction designed to withstand high pressures and eliminating check valves and providing a construction that can rest on a stratum in the well and also by having the entrance to the pump through the side walls, and further by providing a construction which is self contained and in a central alignment with concentric conduits, I am enabled to efficiently raise oil from narrow bored holes in the earth, by cooperating with a double acting pump on the surface of the earth.

A clear conception of an embodiment of the invention and of the operation of devices constructed in accordance therewith, may be had by referring to the drawing accompanying and forming a part of this specification in which like reference characters designate the same or similar parts in the several views.

Fig. 1 is a longitudinal sectional view, through the pump at "F—F" of Figures, 3, 4, 5, 6, 7 and 8.

Fig. 2, is a longitudinal sectional view, through the pump at "G—G" of Figures, 3, 4, 5, 6, 7, 8, showing the complete assembly of the pump and the two concentric conduits that lead to the surface of the earth.

Fig. 3, is a transverse section at "A—A", showing the central alignment of the nozzle and venturi with the two conduits.

Fig. 4, is a transverse section through the pump at "B—B", showing the relation and shape of the motive fluid passageways with the venturi.

Fig. 5, is a transverse section through the pump at "C—C", showing the entrance to the pump from the oil deposit.

Fig. 6, is a transverse section through the pump at "D—D", showing the motive fluid passageways and the nozzle and the means for securing the screen over the entrance to the pump.

Fig. 7, is a transverse section through the pump at "F—F", showing the enclosed chamber located below the entrance to the pump from the oil deposit and the screen which is adapted to screen the entrance to the nozzle.

Fig. 8, is the end view of the pump, showing the end plug.

At this time it may be well to note that

throughout the specification I will term the character of reference 1, as a venturi, however as this nomenclature is more or less limited in its scope, I do not care to be limited to a venturi as my improvement for the want of a better term, as it may be termed an actuating cylinder.

Referring in detail to the characters of reference marked upon the drawings, 2 represents the outer conduit which has threaded connection 3 with the pump body 4, and leads therefrom to the pump on the surface of the earth. 5 is the inner conduit which has threaded connection 6 with the pump body 4 and is adapted to convey the forcing liquid with the fluid raised, to the surface of the earth. As the construction and operation of the pump and tank and piping system on the surface of the earth is well known and shown in my copending application bearing Serial No. 104,159, filed April 23, 1926, I will only describe the parts pertaining to my improvement as all other description would be superfluous. The conduits 2 and 5 are made up of sections coupled together and extend from the pump body 4 to the surface of the earth.

A liquid substantially the same as that liquid being pumped is forced down between conduits 2 and 5 to the pump body 4, through the passageways 7 which are cored in the body 4 and are of oblong curvature in shape, being concentric with the centre of the body 4, to the chamber 8, through screen 9 to the nozzle 10, thence through nozzle 10, through the venturi 1, to the conduit 5.

To create a partial vacuum in the compartment 11, relative to the high head of the liquid in the conduit 5, I make the area of my nozzle 10 of such a size so that the quantity of liquid pumped by the force pump on the surface of the earth will create a velocity, in the said liquid at the nozzle 10, which will be equivalent to that velocity which would be caused by the head of a column of liquid from the surface of the earth or greater, to the pump body 4 in cooperation with my venturi 1. It is obviously dependent upon this creation of a partial vacuum in the compartment 11, that oil is raised from the deposit in the earth to the surface of the earth or higher.

In oil wells of a depth of 3,000 feet or more the casing is 6¼" or less in diameter, and while I could use the said casing as my outer conduit 2 if it were made strong enough to stand about 4,000 lbs. per square inch pressure, I do not care to in this case, because the standard casings used at present in the oil wells is very light, so I make my pump body 4 about 4½" in diameter to permit of drawing the same out of the well in case of sanding up. It should be noted however that in the event of heavier casing I could eliminate making my pump to go inside of the oil well casings and use the said casing as my conduit 2. While I do not care to be limited in my scope to any mentioned sizes I merely mention same to show the novel construction of my pump in view of the small size of the oil well, and how to make a practical pump construction that will operate efficiently one must do actual experimenting. In a 3,000 foot well the velocity of the liquid at the nozzle will be over 350 feet per second, more or less, and the size of the nozzle about ⅛", more or less in diameter, so therefore it can readily be seen that there is the need for a screen 9 to prevent the nozzle from clogging up, this screen being one of my important improvements.

Also when one considers that the pressure in the chamber 8, which chamber is also a novel improvement in view of the art, is the pressure due to the 3000 foot head plus the pressure of the force pump which will be over a 1,000 lbs. per square inch making a total of over 2,550 lbs. per square inch in chamber 8 in a 3,000 foot oil well or over 3,000 lbs. per square inch in said chamber 8 when used in a 4,000 ft. oil well.

Also in an oil well pump where the pressure at the lower end portion will exceed 2,500 lbs. per square inch it is impossible to lift a check valve off its seat without resorting to some mechanical means.

My pump body 4 is an elongated cylindrical casting comprising means in its upper end portions 14 to permit of threaded engagements 3 and 6 for securing conduits 2 and 5 respectively thereto. In said body 4 I core, to one side of the center two longitudinal passageways 7 to permit the forcing liquid, from the respective space between the said conduits 2 and 5, to pass or flow through the body 4 from the upper portion 14 thereof to the chamber 8. Chamber 8 is provided in the lower end portion of the body 4 and is cylindrical in formation, it is enclosed by the side walls 13 and permits of a screen 9 to be installed over the entrance 15 to the nozzle 10. This chamber 8 is enclosed on its lower end portion by a removable plug 16 which has threaded connection with the body 4. Chamber 8 also permits the removing of the nozzle 10 for replacement etc. By referring to Fig. 7 the central formation of chamber 8 will readily be seen.

Above the chamber 8 I have provided a crosswall 17 which extends across the body 4, and into this wall I screw my nozzle 10. The passageways 7 terminate at the lower portion 18 of this wall 17. Above wall 17 is a compartment 11 which provides access to the body 4, from the oil deposit, this compartment 11 being opened to the oil deposit for substantially half the diameter of the body 4, and on the outer diameter portion is encased by a perforated screen 19 which is secured to the body 4 by screws 20.

Above the said compartment 11, is another

cross wall 21 in which I screw my venturi 1. Formed integral with and on the upper portion of this wall 21 I provide an outwardly disposed lug 22 to permit the securing of conduit 5 to the body 4.

While I make the said body 4 of a casting, it is obvious that means may appear to those skilled in the art of making the same out of machined stock in sections, but regardless it appears that the most economical means of making the body 4 is by casting the same.

The nozzle 10 is cylindrical in formation, the outer diameter being threaded to permit of threaded engagement with the body 4, the nozzle hole 23 is tapered and terminates in a small tip 24. It can be replaced by removing plug 16 and screen 9.

The venturi 1, is cylindrical in formation having its outer diameter 25 threaded for threaded enagement with the body 4, it being located in a substantially central position in the body 4, and directly over the nozzle 10, the inner diameter or venturi 26 being located central of flared formations 27 on either side of same.

It should be noted that I provide a space between the tip 24 of the nozzle 10 and the flared end 28 of the venturi 1, in this case this space 29 is about ¼th of an inch.

The venturi 1, can be replaced by removing conduits 2 and 5 and unscrewing the venturi 1 from the body 4.

Plug 16 is a solid cylinder having threads on its outer diameter for threaded engagement with the body 4. By the plug 16 the screen 9 can be readily removed and cleaned or replaced.

Also by the plug 16 enclosing the lower end of the body 4 all pressure of the two columns of fluid will be prevented from entering the oil deposits.

It should be understood that it is not desired to limit the invention to the exact details of construction herein shown and described, for obvious modifications may appear to those skilled in the art.

Having thus described my invention what I claim is:

1. In a pumping apparatus adapted to be operated by a circulating liquid substantially identical with the liquid being pumped, an elongated body comprising a venturi and a nozzle, located central of the said body, an entrance to the pumping apparatus through the side walls of the body, the tip of the nozzle and the entrance to the venturi being in said entrance, an enclosed chamber below said entrance, a passageway for the circulating liquid extending from the upper portion of the body to the said chamber.

2. In a pumping apparatus adapted to be operated by a circulating liquid identical with the liquid being pumped, a body comprising a venturi and a nozzle, said venturi and nozzle being in alignment with each other and spaced apart, an entrance to the pumping apparatus through the side walls of the body, a chamber below said entrance, a perforated screen in said chamber, a passageway for the circulating liquid extending from the upper portion of the body to the said chamber.

3. In a pumping apparatus adapted to be operated by a circulating liquid identical with the liquid being pumped, a cast body comprising a venturi and a nozzle, a cored passageway extending from the upper end portion of the body to an enclosed chamber in the lower end portion of the said body, the said enclosed chamber being substantially central of the said body, the entrance to the said nozzle being in said enclosed chamber, an entrance to the pumping apparatus through the side walls of the body and located above said chamber, the discharge tip of the nozzle and the entrance to the venturi spaced apart and located in the said entrance to the pumping apparatus, means for circulating a liquid through the said body and creating a velocity vacuum in the said entrance to the pumping apparatus.

WILLIAM FREDERICK McMAHON.