

Feb. 26, 1935.

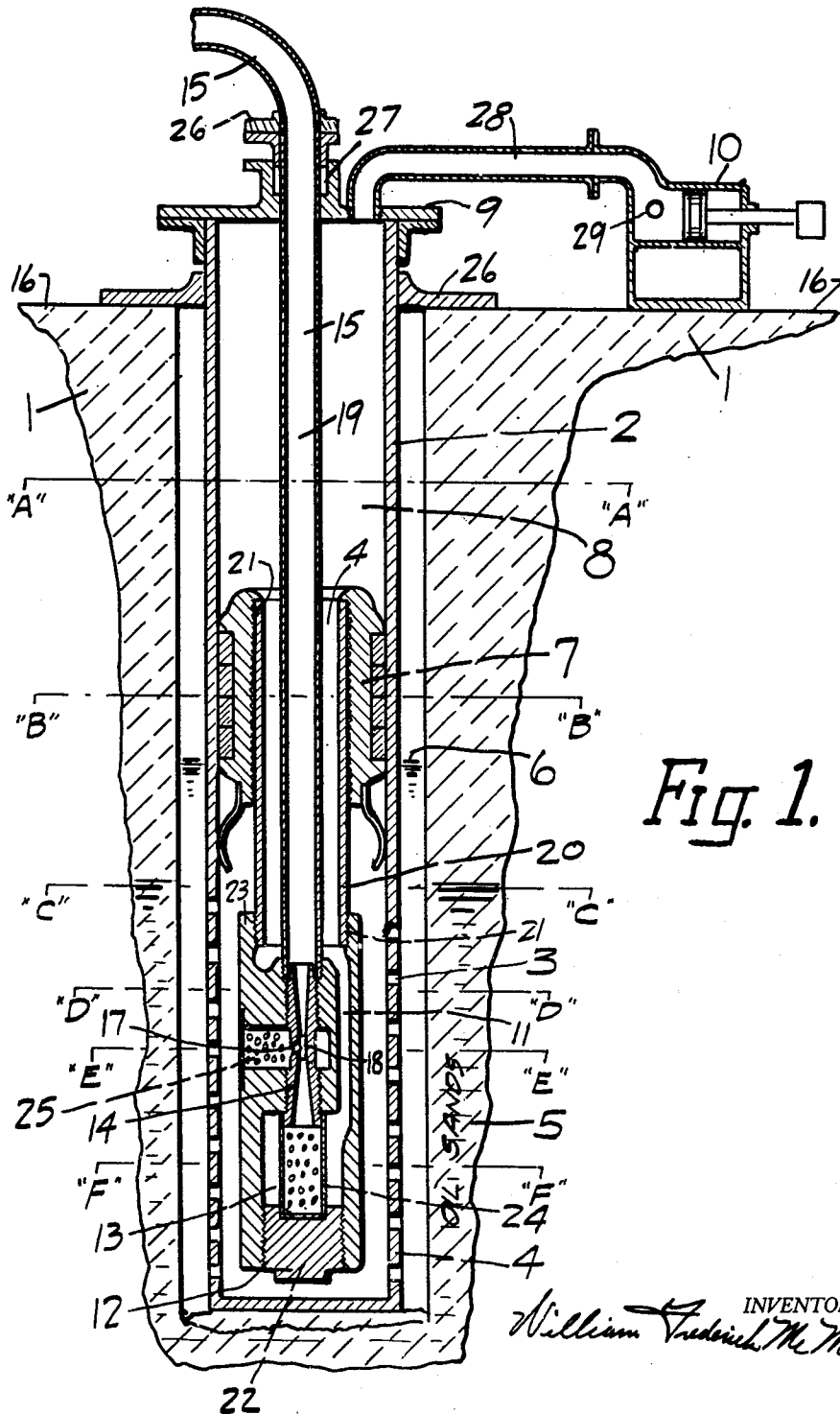
W. F. McMAHON

1,992,436

OIL WELL PUMP

Filed June 23, 1932

3 Sheets-Sheet 1



Feb. 26, 1935.

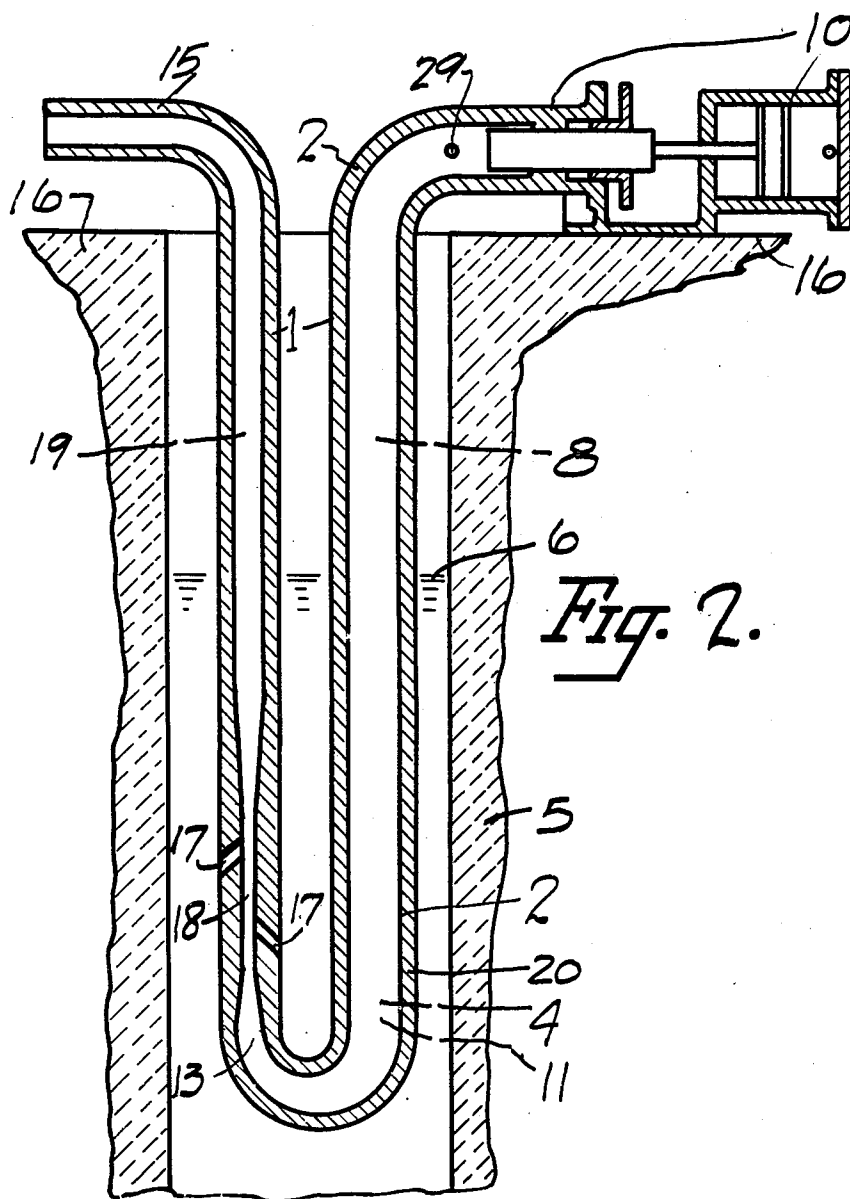
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3 Sheets-Sheet 2



INVENTOR.

William Frederick McMahon.

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3 Sheets-Sheet 3

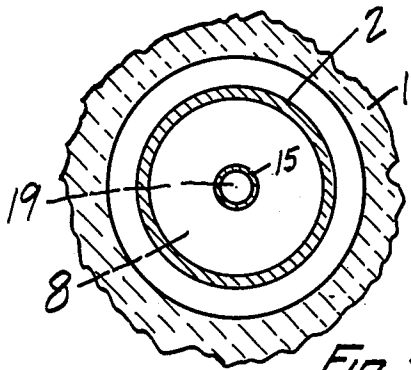


Fig. 3

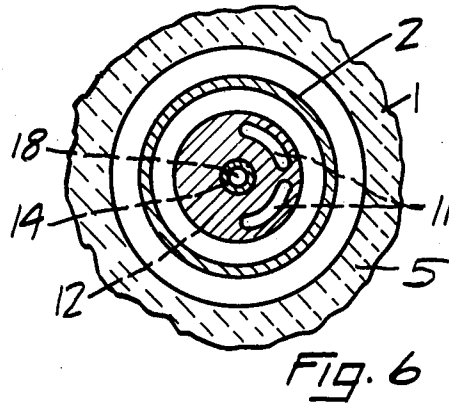


Fig. 6

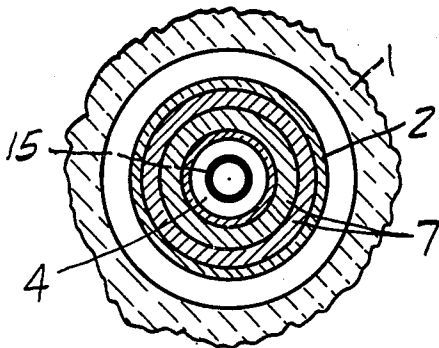


Fig. 4.

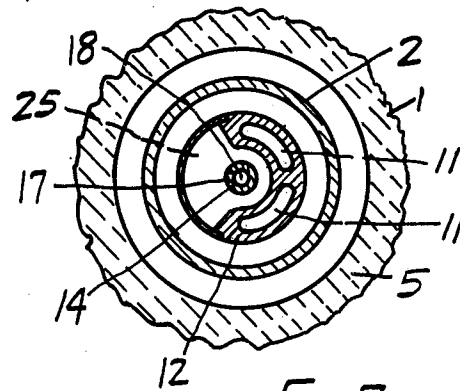


Fig. 7.

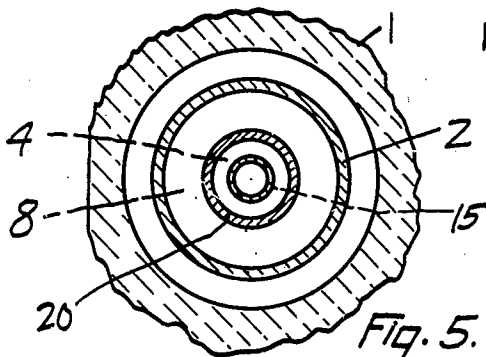


Fig. 5.

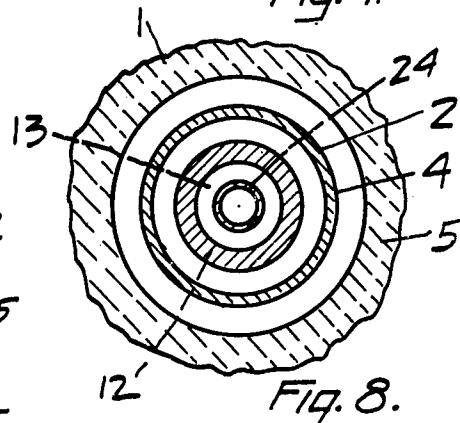


Fig. 8.

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1,992,436

OIL WELL PUMP

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Application June 23, 1932, Serial No. 618,911

12 Claims. (Cl. 103—260)

This invention relates to an oil well pumping apparatus and/or means for raising fluid from oil fluid deposits in the earth.

It is an object of this invention to provide a means adapted for utilizing a flow of fluid through a continuous fluid passageway wherein the velocity of said fluid will be utilized to raise fluid from a bored hole in the earth.

Another object is to provide a device, adapted to be placed in a hole in the earth and having no moving parts therein, to raise fluid from said hole.

A further object is to provide a device containing a continuous fluid passageway contracted in its area at one portion thereof, and having a fluid opening thereto in the side of the said contracted portion of said passageway whereby, the increased velocity of fluid through the said contracted portion of the said passageway will cause a suction in the said fluid opening in the side thereof.

Another object is to provide a device having a continuous fluid passageway which is contracted in its area at one portion thereof whereby, the velocity head of fluid passing therethrough will be greater than the pressure or static head of the fluid above said contracted portion, so that fluid from outside of the said device will enter said device through a passageway at the side of the contracted portion of the continuous fluid passageway in the device without the use of a nozzle and/or a valve.

A still further object is to provide a device adapted to be placed in a bored hole in the earth, said device having a continuous fluid passageway therein adapted to convey a flow of fluid and being so arranged so that a velocity head of fluid is utilized to raise fluid from the bored hole in the earth without the use of a nozzle or the like.

Another object is to provide an oil well pumping device adapted to be placed in a hole in the earth and to convey a flow of forced fluid and being so constructed so that there is no pressure on the oil sands caused by the forced fluid when the device is functioning.

Another object is to provide a pumping apparatus that will eliminate a pulsating suction action upon the oil sands.

Because of the great depths of the present oil wells it is objectionable from an efficient standpoint of view to use a nozzle to discharge into an open end of a column of fluid because the areas or diameters have to be so small due to the pressure heads. And while the nozzle can be arranged to give the required velocity head it is

impossible to efficiently guide the flow of liquid from the tip of the nozzle into the passageway the nozzle is discharging into. It should be noted that, in this improvement I have eliminated a nozzle and solely employ a Venturi-tube. This enables me to provide a continuous, fluid passageway through my device, wherein the suction passageway to my apparatus is at right angles, or less or more than a right angle, to the highest velocity of the flow of fluid in the Venturi-tube and I depend on the velocity head of the fluid passing through the Venturi-tube to offset the pressure head or static head above the said suction passageway so that fluid will enter my apparatus from the oil deposit.

Another object of this improvement is the novel construction arranged so that the present casing in the well is utilized as a conduit for my apparatus, as more clearly shown in Figure 1 of the drawings herewith.

An object is to provide a pumping system that is independent of its depth of submergence in the fluid located in the hole in the earth.

An object is to provide a pumping system for raising fluid, from a hole in the earth, that is composed entirely of fixed parts.

An object is to provide a pumping system, for raising fluid from a hole in the earth, that is operated by a continuous circulating fluid substantially the same as the fluid being raised.

An object is to provide a novel pumping means that requires but one conduit, located above a shutoff packer, to be furnished in conjunction with the present equipment already located in the hole in the earth.

A further object is to provide a pumping apparatus, for raising oil from a hole in the earth, that can be efficiently lowered into the hole in the earth and be efficiently removed therefrom with a minimum amount of operations, and/or work.

An object is to provide a pumping apparatus as more clearly shown in Figure 1 of the drawings herewith.

With these and other objects in view, the invention resides and consists in the construction and novel combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended; it being understood that various changes in the form, proportion, design, size and details of construction may be resorted to by those skilled in the art without departure from the spirit or intent of this invention.

Similar characters of reference denote like or corresponding parts throughout the several figures of the accompanying drawings forming a part of this specification, and upon which;

5 Fig. 1 is a longitudinal sectional view through my pumping apparatus, showing its adaptation with the present oil well casing located in the hole in the earth.

Fig. 2 is a diagrammatic view of my pumping apparatus, showing this new and novel continuous passageway for circulating fluid and utilizing the same to raise fluid from a hole in the earth.

Fig. 3 is a transverse section through the pumping apparatus at "A—A" of Fig. 1.

15 Fig. 4 is a transverse section through the pumping apparatus at "B—B" of Fig. 1.

Fig. 5 is a transverse section through the pumping apparatus at "C—C" of Fig. 1.

Fig. 6 is a transverse section through the pumping apparatus at "D—D" of Fig. 1.

Fig. 7 is a transverse section through the pumping apparatus at "E—E" of Fig. 1.

Fig. 8 is a transverse section through the pumping apparatus at "F—F" of Fig. 1.

25 The majority of oil wells, which are in one sense of the word, holes bored in the earth 1, contain a tubing or casing 2 which is perforated with holes 3 in its lower end portion 34. This perforated section 34 of the casing 2 permits oil or the like to enter into the casing 2 from the oil sands 5. This oil or the like finds its own level 6 in accordance with the gas pressure in the earth in the casing 2. In my pumping apparatus or oil well pumping system, I utilize this casing 2 to form one of my conduits of my substantially U tube circulating system to raise fluid from a hole in the earth.

A packer 7, which is of well known construction, is placed just above the fluid level 6 in the casing 2 and is provided to seal off any fluid from passing from the column of fluid 8 located above it, to the perforated portion 34 of said casing 2. This arrangement permits me to use said casing 2 as one of my U tube conduits.

45 This packer 7 can be any of the well known constructions on the market for sale and further detail description is not necessary.

Now then, as I use a circulating fluid to operate my pumping apparatus: a force pump 10, which is operated by energy derived from some external source, is provided to force a continuous flow of fluid through casing head 9 to the space for the column of fluid 8, hence through passageway 4 to the cored passageways 11 in the lower pump body 12 to the chamber 13, thence up through the Venturi-tube 14 to the macaroni or outlet tubing 15 to the surface of the earth 16.

From tubing 15 the fluid will flow into a tank (not illustrated) and the force pump 10 can suck its supply of circulating fluid from said tank if desired, through the pump intake 29.

This shows that we can use substantially the same volume of circulating fluid, to operate the pumping apparatus, over and over again while the volume of fluid raised will be surplus relative to the circulating fluid.

To raise fluid from the oil deposits through the inlet passageway 17 it will be necessary to maintain a pressure in said inlet 17 at that about or less than atmospheric pressure. Therefore the velocity of the fluid passing through the venturi 14 must equal or be greater than that velocity which would be caused by the static head of fluid located above said venturi 14. To create this velocity of fluid flowing through a venturi 14,

the passageway 18 therein is contracted in size directly relative to the volume of fluid adapted to pass therethrough so that the resulting velocity passing through the said passageway 18 will equal or be greater than that velocity cause by the static head of the column of fluid 19 located above said passageway 18. Hence this construction permits fluid to enter the pumping system or conduit 15 through the inlet passageway 17, and be raised to the surface of the earth 16 with the cooperation of the force exerted by the force pump 10. It should be carefully noted that, the inlet passageway 17 is directly connected with the contracted passageway 18 of the venturi 14 or Venturi-tube 14. Should this inlet passageway 17 be located or be connected with any other portion of the Venturi-tube 14, other than this contracted passageway 18, it would result in an inefficient pumping apparatus. And it is upon this very construction, of the inlet passageway 17 being directly connected to the contracted passageway 18 of the Venturi-tube 14 where the velocity of the fluid passing through the Venturi-tube 14 will be the greatest, that I base my improvement which is new and useful in the art of pumping apparatus of this kind. While I have shown my pump applied to oil wells it may obviously be used in water wells and used to equally good advantage.

As the casing 2 is utilized to provide a column of fluid 8 above the packer 7, to continue said column 8 to the entrance of the venturi 14, I provide a tube or pipe 20 as a joining link between the packer 7 and the cast body 12. This pipe 20 will have threaded engagement 21 both with the packer 7 and the cast body 12.

The cast body 12 (which may be made up with jointed sections if desired) contains cored passageways 11 leading from the upper portion thereof 23 to the enclosed chamber 13, wherein the entrance to the venturi 14 is located. The venturi 14 is substantially formed a typical venturi and comprises a side inlet passageway 17 and has threaded engagement with the body 12 so that it may be removed at any time and replaced. A plug 22 is provided with threaded connection with the cast body 12 to facilitate cleaning out of the chamber 13 that contains a screen 24 adapted to prevent large matter from entering the venturi 14. If desired a screen can be installed to screen the entrance to the passageway 4. This screen can be attached to the tubing 15 and packer 7 at the upper end portion of the said packer 7.

A screened entrance to the cast body 12 is provided at 25 to permit fluid from the deposit 5 to reach the inlet passageway 17 of the venturi 14.

Conduit 15 is directly secured to the cast body 12 and conveys all the circulating fluid plus the fluid being raised to the surface of the earth 16. This conduit 15 is supported by the casing head 9 which is in turn supported by an approved means 26 on the surface of the earth 16. A stuffing box means 27 is provided to seal the pressure off around the conduit 15 where it leaves the casing head 9.

A pipe 28 serves to connect the force pump 10 with the casing head 9 and conveys the fluid therefrom to the casing 2.

The novel means of lowering the pumping system into the well consists of lowering the cast body 12, the pipe 20, the packer 7 and the conduit 15 at the same time, it also provides an arrangement of rigidly securing the entire system as a unit at the time of lowering the pumping sys-

tem into the well while at the same time utilizing the present casing 2 in the well as part of the pumping unit. While, in my U. S. Patent No. 1,779,483 filed April 23, 1926, I stated in page 1, lines 76 to 78 therein that, ("It should be noted that the oil well casing itself can be used for pipe 14 if it is so desired"), the pipe 14 in that patent being the equivalent of casing 2 in this specification, I believe that my combination of elements utilizing said casing 2 to be an improvement in the art.

Referring to Fig. 2 of sheet 2 of the drawings herewith, this drawing shows a diagrammatic view of my oil well pump. A force pump 10, which may be any kind of a pump, is located on the surface of the earth 16 and is operated by energy derived from some external source to pump water and the like or other fluid.

The fluid pumped is forced down conduit 2 in passageway 8, through passageways 4 and 11 to chamber 13, hence up through the contracted passageway 18 and passageway 19 in conduit 15, to some point above the surface of the earth 16. The area of the contracted passageway 18 will be such so that the pressure of and the volume of the fluid being forced by the pump 10 therethrough, said passageway 18, will create a velocity in passageway 18, equal to or greater than that velocity which would be caused by the head of fluid above said passageway 18. Therefore it is seen that the greatest velocity of the fluid passing through the pumping system 1 is attained in the contracted passageway 18. The inlet passageway 17, from the well to the system 1, is directly connected to this contracted passageway 18, or in other words, the inlet passageway 17, adapted to permit fluid to enter the pump from the deposit, is connected to the pump at the place wherein the velocity of the fluid being circulated is the greatest.

From my above description it is seen that I have provided a continuous fluid passageway throughout the entire system, eliminating any breaks such as required by nozzles, valves and the like, also there is not a moving part in the entire system located within the well and a minimum number of parts are required due to the packer installation. It is thought that this novel assemblage of fixed parts being so arranged as to utilize energy derived from some external source for the purpose of raising fluid from a bored hole in the earth through an inlet passageway to the pump where the velocity of the fluid, being circulated in the pump, is the greatest, constitutes a new and useful improvement.

Suitable vent or vents, consistent with good piping practice, to be installed at any place in the system and below packer 7, to vent any air or gas pocket that will or may accumulate in casing 2 or in any other conduit so as to prevent such air or gas pockets from interfering with the raising of fluid from 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, and this improvement may be applied to other mechanisms and uses and used to equally good advantage.

It may be well to state here that it is obvious that, the force pump 10 can be connected to conduit 15 and fluid forced down said conduit through the cast body 12, hence up through passageway 4 to the surface of the earth, in other words just reverse the direction of the flow of

fluid and be used to equally good advantage, without departing from my continuous U tube circulating passageway. This feature tends to prove that I have an unobstructed and continuous passageway for fluid because it is obvious that I can reverse the flow of circulating fluid at any time without changing any part of the pumping apparatus located in the hole in the earth, and at the same time still raise fluid from deposits in the earth.

This continuous circulating passageway having an inlet passageway, from the deposit in the well, thereto at the point therein where the velocity of the fluid being circulated is greatest is desired to be claimed as follows and what I claim is;

1. In a pumping apparatus for raising fluid from deposits in the earth and comprising a packer and an oil well casing two conduits leading from the surface of the earth to the fluid deposit and connected to form a U tube construction, one of said conduits formed by the said packer and oil well casing, said conduits being adapted to hold a fluid leading from the surface of the earth, means connected with one conduit to impart a movement to said joint column of fluid, a contracted fluid passageway in the other conduit adapted to increase the velocity of the movement of fluid therethrough, an inlet passageway from the deposit to the said contracted passageway at the place therein where the velocity of the fluid passing therethrough is greatest and adapted to cooperate with the velocity of the movement of fluid in said contracted passageway to raise fluid from the deposit, whereby the velocity head of the quantity of fluid flowing through said contracted passageway corresponds to or is greater than the static head or pressure head of the column of fluid above said contracted passageway.

2. In a pumping apparatus for raising fluid from oil deposits in the earth and comprising a packer and an oil well casing, connected concentric conduits adapted to form a continuous column of fluid extending from the surface of the earth to the vicinity of the oil deposits in the earth and back to the surface of the earth, one of said conduits formed by the said packer and oil well casing, means for imparting a movement to the said column of fluid, a contracted fluid passageway having a decreased area relative to the area of the inside diameter of one conduit and comprising inlet passageways leading into said contracted fluid passageway at its minimum area portion thereof wherein the velocity of fluid passing therethrough is greatest in the pumping apparatus and adapted to cooperate with the movement of said column of fluid to raise fluid from the oil deposit, whereby the velocity of the fluid flowing through the contracted fluid passageway is greater than the velocity caused by the static head of the column of fluid above said contracted fluid passageway and the opening of the inlet passageway thereto.

3. In an oil well pumping apparatus for raising fluid from deposits in the earth and comprising a packer and an oil well casing, two concentric tubular conduits leading from the surface of the earth to the fluid deposit and connected to form a continuous U tube construction, said conduits being adapted to hold a fluid forming a continuous U shaped column of fluid in a continuous fluid passageway leading to and from the surface of the earth, one of the said conduits formed by the said packer and oil well casing, means connected to one of the conduits to impart a

pressure and movement to the said column of fluid, an inlet passageway to one conduit from the deposit leading into the minimum area of a contracted passageway in said conduit, said contracted passageway having a smaller area than that of the area of the fluid passageway in said conduit, whereby the velocity of the movement of fluid through the contracted passageway is greater than that caused by the static head of the column of fluid above said contracted passageway thereby creating a velocity vacuum in the opening of the inlet passageway, to raise liquid from the deposit in the earth.

4. In an oil well pumping apparatus for raising fluid from deposits in the earth and comprising a packer and an oil well casing, conduits adapted to form two connected and continuous columns of fluid, one of said columns of fluid having a lower specific gravity than the other and formed by the said packer and oil well casing, there being a contracted passageway in one of the said conduits, means for forcing fluid through said contracted passageway, an inlet passageway from the deposit to said contracted passageway, said inlet passageway on one side of said contracted passageway located at the place therein where the velocity of the fluid passing through said contracted passageway is greatest and cooperating with the velocity of said flow of fluid through said contracted passageway to raise fluid from the deposit.

5. In an oil well pumping apparatus for raising fluid from deposits in the earth and comprising a packer and an oil well casing, two connected and continuous conduits leading from the surface of the earth to the deposit, one conduit having a greater area of fluid passageway than the other, a contracted fluid passageway in the conduit having the lesser area and an inlet fluid passageway from the deposit to the side of the said contracted fluid passageway, a greater area in the other conduit formed by the said packer and oil well casing, a pumping means for imparting pressure and movement to the continuous column of fluid in the conduits, whereby the velocity head of the movement of the column of fluid through the contracted fluid passageway is equal to or greater than the static head or pressure head of the column of fluid above said contracted fluid passageway creating thereby a vacuum in the said inlet passageway from the deposit.

7. In an oil well pumping apparatus adapted to be operated by a circulating fluid for raising fluid from deposits in the earth and comprising a packer and an oil well casing, two connected conduits adapted to provide a continuous and unbroken passageway for the circulating fluid, one of the said conduits formed by the said packer and oil well casing, said conduits extending from the surface of the earth to the vicinity of the oil deposit, means for moving the circulating fluid by energy derived from some external source, a contracted passageway for the circulating fluid in said continuous fluid passageway, an inlet passageway from the oil deposit to the side of the said contracted passageway at the place wherein the velocity of the fluid passing through the said contracted fluid passageway is greatest, whereby fluid is raised from the oil deposit by the action of a greater velocity of flow of the circulating fluid through the said contracted passageway than the velocity of the fluid corresponding to the static head or pressure head of the column

of fluid above the entrance of the inlet passageway to the said contracted passageway.

8. In an oil well having a casing and an oil deposit, a pumping apparatus adapted to be operated by a circulating liquid and comprising a packer, a cast body comprising a Venturi-tube, a pipe leading from the packer to the cast body and forming a continuous passageway from the pipe through the cast body, through the Venturi-tube, to a tube, said tube leading from the cast body to a casing head secured to the said casing and extending through the said casing head and adapted to be opened to the atmosphere, means for lowering the said pumping apparatus as a unit into the said casing and securing same thereto, said means formed as part of the said pumping apparatus.

9. In an oil well having a casing, a pumping apparatus adapted to be operated by a continuous flow of liquid in cooperation with a venturi comprising an entrance thereto from the oil deposit, said entrance to the venturi being at the place wherein the velocity of the liquid passing therethrough is greatest, a tube leading from the said venturi to a casing head secured to said casing, said tube passing through said casing head and adapted to be opened to the atmosphere, means for utilizing the said casing to convey a column of liquid from a force pump to the said venturi and comprising a packer, a means deriving its force from some external source to move said column of fluid through the said venturi, whereby a sufficient velocity of fluid is created to raise fluid from deposits in the earth to the surface of the earth.

10. In an oil well having a casing, a pumping apparatus adapted to be operated by a circulating liquid forced by a pressure pump and comprising a continuous U tube circulating passageway, a pump body having a Venturi-tube in said passageway and containing an inlet passageway thereto, a means deriving its power from some external source and adapted to create a pressure upon a column of fluid in said circulating passageway and to move said fluid through said Venturi-tube, a packer connected to the pump body comprising the Venturi-tube and adapted to make a seal with the said casing and form the continuous circulating passageway.

11. In an oil well having a casing, a pumping apparatus adapted to be operated by a circulating liquid, a continuous U tube circulating passageway and containing an inlet passageway from the oil deposit thereto at the place therein where the velocity of the fluid passing therethrough is the greatest, a means adapted to utilize energy derived from some external source to create a pressure and movement to a column of fluid in said continuous circulating passageway, a packer connected to the pump body comprising the Venturi-tube and adapted to make a seal with the said casing and form the continuous circulating passageway, a tube from the Venturi-tube to the surface of the earth, whereby fluid passing through the Venturi-tube will have a greater velocity than that velocity caused by the static head of a column of fluid above the said Venturi-tube and create a suction in the said inlet passageway from the oil deposit to the Venturi-tube and raise fluid from the oil deposit to the surface of the earth.

12. In an oil well having a casing, a pumping apparatus comprising a Venturi-tube and a pump body having a continuous U tube circulating passageway and adapted to be operated by a

circulating liquid substantially the same as the fluid being raised, a packer connected to the pump body comprising the Venturi-tube and adapted to make a seal with the said casing and
5 form the said continuous circulating passageway, a tube leading from the packer to the said pump body and secured thereto, a tube leading from the Venturi-tube to the surface of the earth, means for moving a column of fluid in the said continuous circulating passageway to raise fluid from oil deposits in the earth.

WILLIAM FREDERICK McMAHON.

CERTIFICATE OF CORRECTION.

Patent No. 1,992,436.

February 26, 1935.

WILLIAM FREDERICK McMAHON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, first and second columns, for the claim numbers "7, 8, 9, 10, 11 and 12 " respectively, read 6, 7, 8, 9, 10 and 11; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 8th day of October, A. D. 1935.

(Seal)

Leslie Frazer
Acting Commissioner of Patents.