Aug. 5, 1930. W. SHELDON 1,772,369

WELL BAILING PUMP

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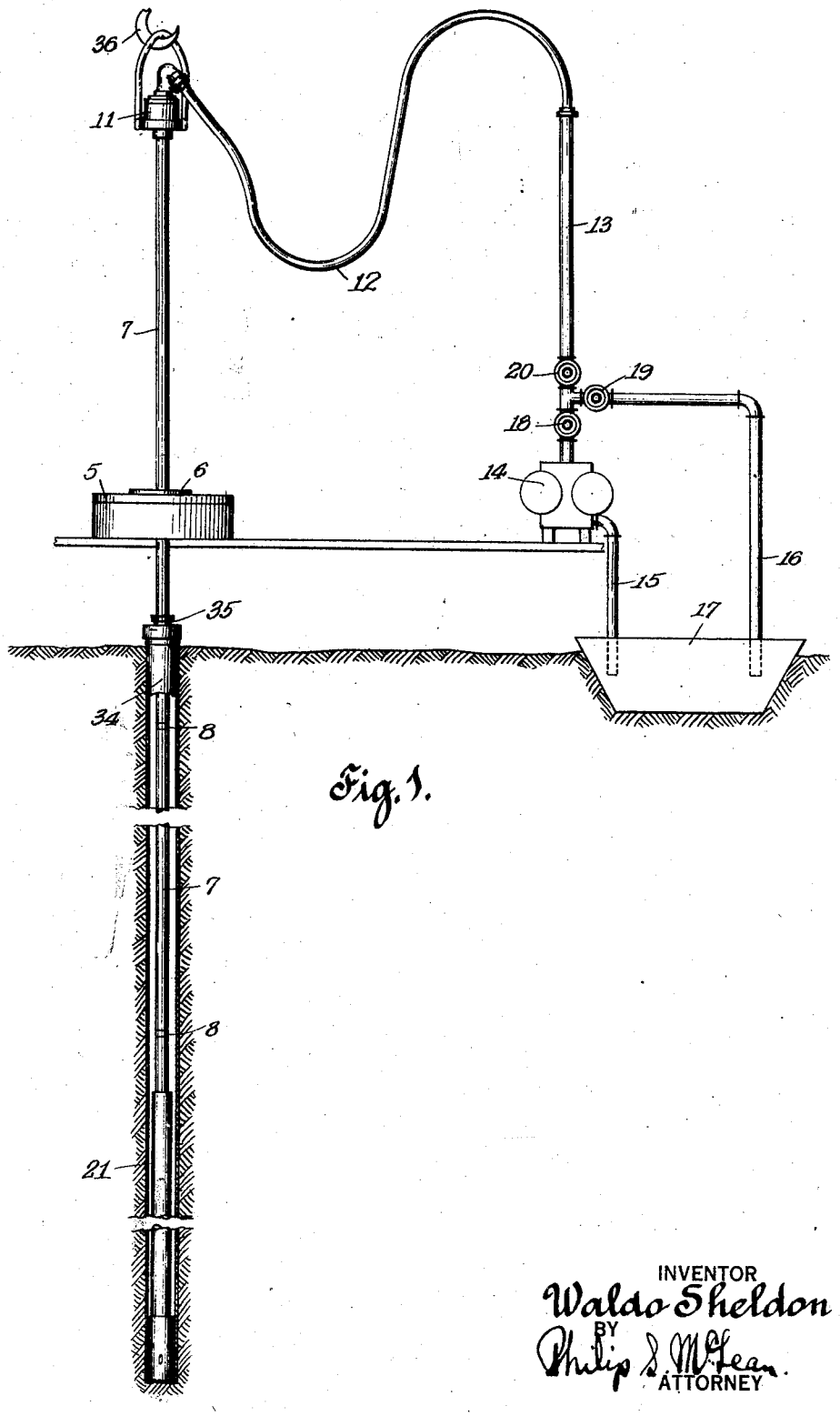


Fig. 1.

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Fig. 2.

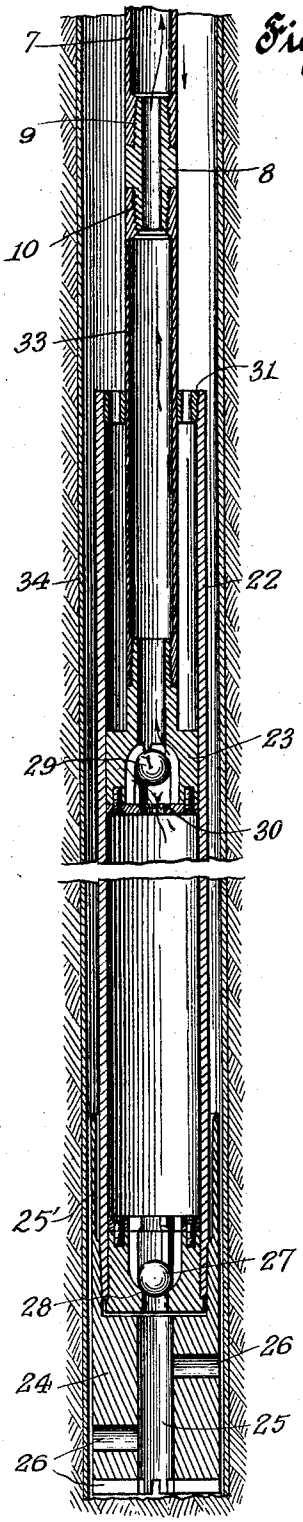


Fig. 3.

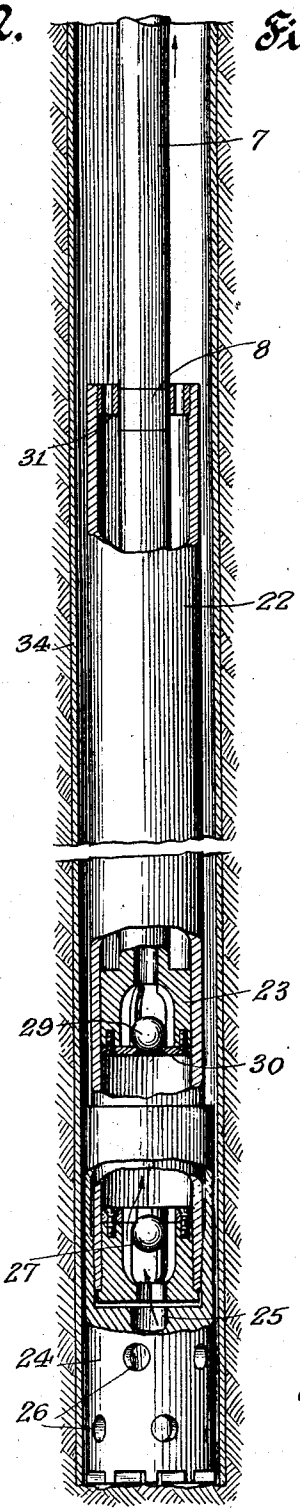
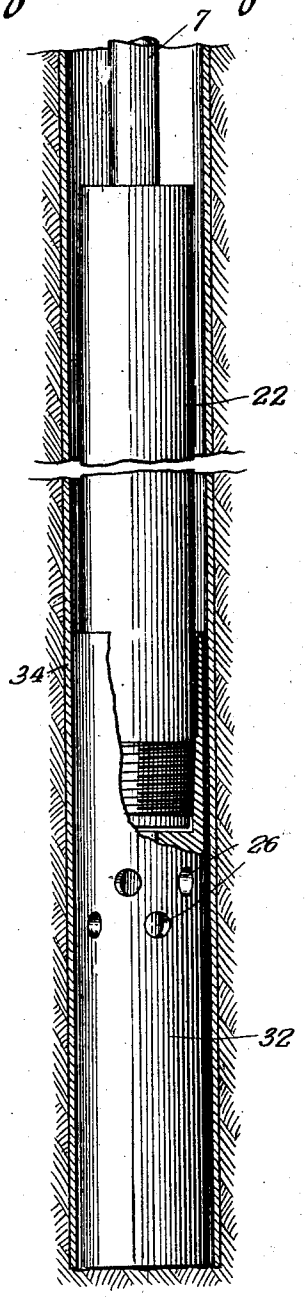


Fig. 4.



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UNITED STATES PATENT OFFICE

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WELL-BAILING PUMP

Application filed August 1, 1925. Serial No. 47,599.

This invention relates to the drilling of oil wells and the bailing of such wells.

For bailing operations the present day practices are either to use a special bailing bucket or to use a special bailing pump. The first of these methods is cumbersome, slow and tedious. The second method is expensive, requiring the sinking of a special pump casing with numerous appurtenances. Both methods require considerable additional equipment over that necessary for the drilling operations.

Special objects of this invention are to overcome the objections noted and to provide simple, practical means for bailing and which will make use of and be formed in part by regular parts of the usual rotary drilling rig.

In the attainment of these objects one feature of the invention consists in utilizing the tubular drill stem which is used in rotary drilling, for supporting and operating a long stroke pump, lowered in the hole by said drill stem and then operated by raising and lowering the stem or pipe. This method enables the flexible hose which is usually connected with the head of the drill pipe by a swivel to be utilized as a part of the pump conduit.

Various other novel features and advantages of the invention will appear as the specification proceeds.

In the drawings accompanying and forming part of this specification, the invention is shown embodied in only one of its many possible commercial forms, so it should be understood that the structure may be modified without departure from the basic spirit and scope of the invention.

Figure 1 is a more or less diagrammatic broken view illustrating application and adaptation of the invention to a rotary well drilling outfit.

Figures 2 and 3 are sectional views on an enlarged scale of the pump structure attached to the lower end of the drill pipe.

Figure 4 is a broken detail showing the pump supported with its intake above the bottom of the well.

The rotary illustrated in Figure 1 is of the type disclosed in my co-pending applications, Serial #711,982; 739,495 and 6,535, in which the rotary table indicated at 5 has slidingly keyed to it, a sleeve 6 which can be raised and lowered by a hydraulic cylinder. This sleeve ordinarily carries a chuck in the nature of a collet for gripping the drill stem indicated at 7. As the invention is adapted to other forms of rotaries and as the hydraulic pressure feed and chuck form no parts of the present invention, the same are not illustrated.

The drill pipe 7 is shown as of the special flush joint construction disclosed and claimed in my co-pending application, #43,131, in which adjacent sections of pipe are connected by coupling members 8 shown in Figure 2 as screwed fast at 9 in the end of one section and having a removable box and pin joint 10 with the other section. This flush joint pipe is decidedly advantageous in the present invention because of the continuous smooth flush exterior it presents, but as with the rotary, it should be understood that the invention is not necessarily limited to this particular type of drill pipe.

For the ordinary drilling operations, a water swivel 11 is connected with the upper end of the drill pipe and a length of flexible hose 12 extends from the swivel to the upper end of a stand pipe 13 which is in communication with the pump indicated at 14. This pump is shown connected in the usual way by inlet and return piping 15, 16 with the mud tank 17 and as provided with valves 18, 19, 20 by which a local circulation can be controlled through the tank with valves 18, 19 open and valve 20 closed or the mud be forced down through the drill pipe with valves 18, 20 open and valve 19 closed.

The operation of the rotary is so well known as to require no description. When bailing becomes necessary, with this invention, instead of discarding the drill pipe and substituting special bailing apparatus in its stead, the drill pipe is retained and used as a connection for lowering and operating a long stroke bailing pump and as a conduit for carrying the flow to the surface. This pump structure is indicated in a general way

at 21 in Figure 1, attached to the lower end of the drill pipe.

The structure of the pump may vary but preferably it is of a long stroke type such as illustrated in Figures 2 and 3, where it is shown made up of a long cylindrical barrel 22 of a size to be lowered into the bore and a piston 23 operating in said barrel and directly attached to the lower end of the drill stem.

The lower end of the barrel is shown as having a heavy shoe 24 screwed thereon, provided with a central bore 25 and lateral branches 26, which shoe serves as a weight for steadying and holding the barrel in place at the bottom of the hole and as an inlet to the pump barrel. The weight has an upwardly projecting portion 25' serving as a sleeve to surround the lower end of the pump barrel and foot valve and protecting the valve from injury which might result when lowering the pump structure down into the hole. Within the lower end of the barrel is provided an upwardly opening valve 27 arranged to cooperate with an upwardly faced seat 28 and the piston carries an upwardly opening valve 29 cooperating with an upwardly faced seat 30. The upstroke of the piston within the pump barrel is limited by engagement of the piston with a guide and stop ring 31 provided in the upper end of the barrel.

In operation, to use the bailer it is only necessary, after uncoupling the drill pipe from driven engagement with the table, to withdraw the pipe, attach the pump onto the lower end of the drill pipe and then lower the drill pipe into the hole until the pump barrel comes to rest on the bottom. Then, by raising and lowering the drill pipe, with the hoist mechanism provided for that purpose, the apparatus will operate to pump the well liquid up through the hollow drill stem and such liquid will be carried off through the swivel and flexible hose which is already attached at the head of the drill stem and down through the stand pipe from whence it may be piped off in any direction.

In place of the usual hoist, a special pumping rig may be utilized for reciprocating the drill stem but the ordinary hoist will suffice for the purpose, being operated to actuate the pump at the desired pumping speed. The hose is sufficiently flexible for this pumping action and is usually of a length to allow for the long stroke used, the connection with the stand pipe preferably being made somewhere near the middle of such stroke.

The pump chamber into which the liquid enters being below the piston, is filled upon the upstroke of the piston, as will be clear from Figure 3, the piston valve being closed in this instance and the lower, inlet valve opening to admit the liquid which rises into the pump chamber, the static head of the liquid in the well filling the chamber and assisting in lifting the piston and drill stem. On the down-stroke of the drill pipe, the inlet valve closes and the piston valve opens so that the liquid trapped in the pump chamber below the piston is forced up through the conduit provided by the drill pipe. The entire weight of the drill pipe thus becomes effective on the active stroke of the pump and provides abundant power to lift the liquid and discharge it through the flexible hose and stand pipe. The upward stroke of the drill pipe is aided by the static head of the liquid in the well so that with the expenditure of a moderate amount of energy, a powerful pumping effect is obtained and this with the long stroke action makes the invention particularly suited to the pumping of deep wells.

The pump attachment is relatively simple and of sturdy construction, requiring no special care in handling or operation. Of importance in the latter connection is the fact that "overstroking" cannot injure the device as in the lowering movement the liquid cushions the piston and the shoe at the foot of the pump is strong enough to stand any "hammer" of the drill pipe, while an excessive lifting movement simply brings the piston up into engagement with the guide at the upper end of the cylinder, lifting the cylinder off bottom.

If it be desired to take the liquid from a higher level at some point above the bottom of the hole this is readily effected by simply screwing on one or more supporting pipe sections onto the bottom of the pump cylinder, as indicated at 32 in Figure 4. In such a case the supporting shoe may be screwed onto the foot of such a supporting pipe section or sections.

To facilitate connection of the pump attachment to the drill stem, the piston may be carried by a tubular section 33 similar to the drill pipe sections and having a box and pin joint 10 (Figure 2) with the coupling member on the lower end of the drill pipe. This means that the pump can be quickly attached to or detached from the drill pipe and the flush form of the joints presents a continuous smooth cylindrical exterior which does not in any way interfere with the operation of the drill pipe as a reciprocating pump plunger. One of these flush joints is indicated in Figures 2 and 3 as actually passing through the guide in the upper end of the pump barrel. The utilization of the weight of the drill stem enables the pump to be operated with a long stroke limited only by practical working conditions, such for instance as the height of the derrick, which determines the distance the drill pipe can be raised and lowered in the pumping action.

The invention, it will be seen, provides a practical form of long stroke pump which

can be directly combined and used in conjunction with the rotary drill pipe, utilizing the drill pipe adjuncts for creating the pumping action and for carrying off the pumped liquid. The rotary table does not interfere with the pumping action after the drill pipe has been freed therefrom and may be used in fact as a guide for the drill pipe, the flush joints enabling the pipe to pass continuously through the table.

In the present disclosure, the well has a casing 34 carrying a stuffing box 35 and this stuffing box serves the additional function of a guide for the drill pipe during its pumping action, the flush joint structure of the drill pipe enabling it to operate through this stuffing box with perfect freedom. If the hoist of the rotary is used as the means for reciprocating the drill stem, the same connections which sustain the swivel during the rotary drilling operations may be employed during the pumping operations. Thus in Figure 1 the hook 36 of the traveling block is shown connected with the swivel and in use is a part of the means for raising and lowering the drill stem.

What is claimed is:

A pumping combination for rotary drilling equipment, comprising a pump barrel, an upwardly opening standing valve in the lower end of said pump barrel, a weighting shoe attached over the lower end of said pump barrel and over the standing valve located therein, said weighting shoe having a longitudinal passage opening directly to said standing valve and a lateral branch passage or passages in communication with said first passage for taking off oil at a desired level or levels above the bottom of the hole in which the shoe is rested, a piston operating in the pump barrel and having an upwardly opening valve to pass the oil on the down stroke of the piston, a hollow piston rod connected to said piston operating out through the top of the pump barrel and having one element of a rotary tool joint and a string of drill pipe having the companion element of a tool joint and thereby connected with said hollow piston rod.

In witness whereof, I have hereunto set my hand this 29th day of July, 1925.

WALDO SHELDON.