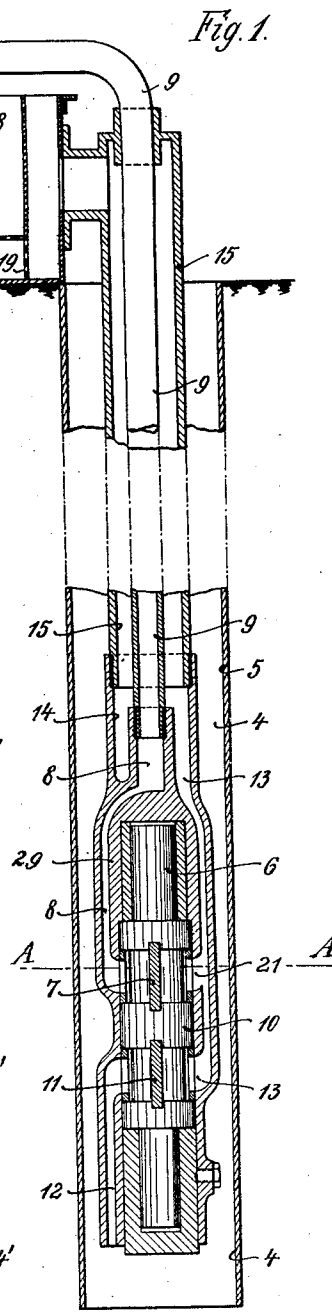
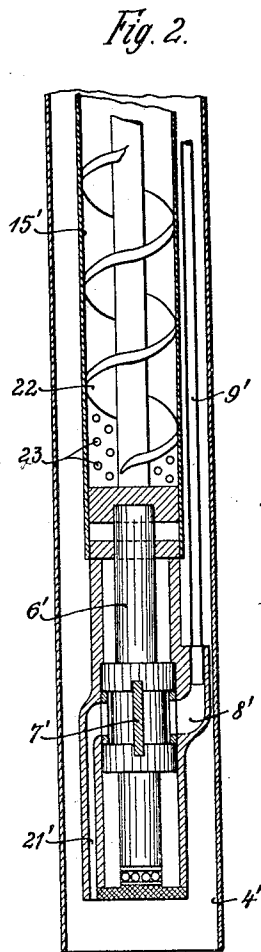
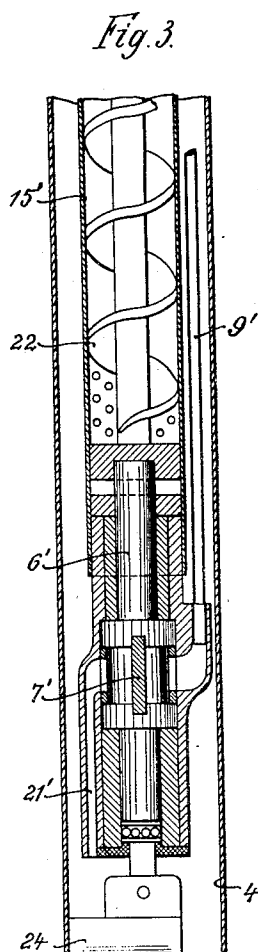
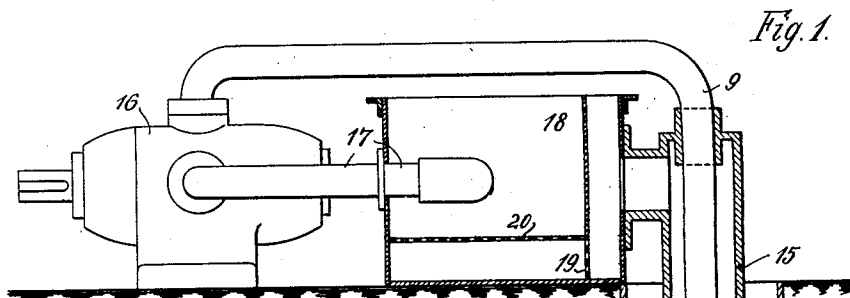


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 APPARATUS FOR HOISTING OIL, BRINE, OR OTHER LIQUIDS FROM WELLS.
 APPLICATION FILED SEPT. 9, 1914.

1,403,699.

Patented Jan. 17, 1922.



Witnesses:

M. Reimer.

M. Hamilton.

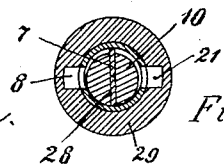


Fig. 4.

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UNITED STATES PATENT OFFICE.

MORITZ LOEWENTHAL, OF LICHTERFELDE, AND FRITZ EGERSDÖRFER, OF CHARLOT-
TENBURG, GERMANY.

APPARATUS FOR HOISTING OIL, BRINE, OR OTHER LIQUIDS FROM WELLS.

1,403,699.

Specification of Letters Patent. Patented Jan. 17, 1922.

Application filed September 9, 1914. Serial No. 860,844.

To all whom it may concern:

Be it known that we, MORITZ LOEWENTHAL, a citizen of the German Empire, residing at Lichterfelde, near Berlin, Germany, and
5 FRITZ EGERSDÖRFER, a citizen of the German Empire, residing at Charlottenburg, near Berlin, Germany, have invented certain new and useful Improvements in Apparatus for
10 Hoisting Oil, Brine, or other Liquids from Wells; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

15 Our invention relates to improvements in apparatus for hoisting oil, brine, or other liquids from wells, and the object of the improvements is to provide an apparatus which is effective in operation and economical even under the most unfavorable conditions. With this object in view our invention consists in hoisting the liquid by means of a pump which is located at the bottom of the well and which is driven by means of a
25 motor provided with one or more revolving pistons which is directly coupled to the pump and which for this reason is likewise located at the bottom of the well. The motor and pump are arranged one above the
30 other, with their main shafts extending, preferably, in line with each other vertically; and they are both valveless. Thereby we are enabled to operate the apparatus under a pressure of several hundreds of atmospheres and to construct the same with a diameter which is so small that it can be brought from above into the well. Therefore the apparatus is driven at the bottom of the well in an economical way, the power
40 medium being supplied through a stationary pipe. If a liquid is used for driving the motor with a rotating piston the said liquid can be compressed to very high pressure so that it transmits much power to the bottom of the well, though the amount of liquid is comparatively small. In this case the efficiency of the pump is such, that it can force upwards large amounts of the liquid to be hoisted apart from the pressure medium.

50 In a preferred embodiment of the invention we use as a pressure medium the same liquid which is hoisted from the well, so that it is not necessary thereafter to separate the pressure medium and the hoisted liquid. In
55 this embodiment we prefer to discharge the

pressure medium from the well in such a way that it is directed downwards and against the bottom of the well, so that the ground is stirred up by the power which is still left within the liquid. In another embodiment we use compressed gas such as air as a driving medium, which gas is discharged into the well and assists the upward movement of the liquid. In both cases the motor with rotating piston is advantageous in this respect that within the pressure conduit no shocks or blows are caused by the pressure medium, because the flow of the liquid is uniform.

The pump is preferably constructed in the form of a screw pump or as a pump with rotating piston. In both cases it is directly coupled with the motor. If the pump is constructed in the form of a pump with a rotating piston, it is preferably enclosed within the same casing as the motor, so that the outer form of the apparatus is that of a pipe without any movable parts projecting therefrom.

Apparatus of the class described have no valves, so that they can be used for forcing liquids which have sand or other foreign matter admixed therewith. For this reason we are enabled to connect the apparatus with a drill, in which case the apparatus can be used for forcing the well further downwards. Therefore it is not necessary to remove the apparatus and the drill from the well and to bring the same again into the well, which is particularly expensive where the well is deep. Besides it is not necessary to provide special rods for the drill.

For the purpose of explaining the invention several examples embodying the same have been shown in the accompanying drawing, in which the same letters of reference have been used in all the views to indicate corresponding parts. In said drawing—

Fig. 1, is a view partly in section showing the whole apparatus in connection with apparatus for imparting power to the driving medium,

Fig. 2, is a longitudinal section of the part of the hoisting apparatus which is located at the bottom of the well and which comprises a motor with revolving piston and a screw pump,

Fig. 3, is a section similar to that shown in Fig. 2 and showing an apparatus equipped with a drill, and

Fig. 4, is a horizontal cross-section taken on the line A—A of Fig. 1.

Referring to the example shown in Fig. 1, the well 4 is equipped in the usual way with pipes 5 providing a lining therefor. At the bottom of the well a motor 6 is located which consists of an upright main shaft or rotary drum 10 receiving within slots 28 one or more reciprocating pistons 7. As appears from Fig. 4, the casing 29 of the motor is internally eccentric of the axis of the drum 10 carrying the pistons, so that the pistons are reciprocated within the drum during rotation of the latter. The pressure medium is supplied to the chambers provided between the casing 29, the drum 10 and the pistons 7 through a port 8 which communicates with a supply pipe 9 extending to the top of the well and a suitable supply for a pressure medium. The pressure medium is adapted to be discharged through a passage 21. The drum 10 is rotated by the pressure medium acting on the pistons 7, the direction of rotation remaining always the same.

In the example shown in Fig. 1 the drum 10 is equipped with a second set of pistons 11 which act as pump pistons and which are constructed in the same way as the pistons 7. The eccentric chamber within which the pistons rotate communicates with an inlet passage 12 and an outlet passage 13. All the parts are enclosed within the same casing 29. At its upper end the passage 13 merges in a tubular portion 14 of the casing, which encloses the upper end of the passage 8 and which is connected with a pipe 15 through which the liquid is forced upwards. The pressure pipe 15 embraces the supply pipe 9 for the pressure medium over the whole length of the latter. The pipe 9 is connected above the ground with a pressure pump 16 the suction pipe 17 of which extends into a receptacle 18. The latter communicates with the pipe 15 so that the liquid forced from the well is discharged into the receptacle 18. Therefore in the example shown in Fig. 1 a part of the liquid which has been forced from the bottom of the well is used for transmitting power to the motor 6. In order that no impurities may have access to the inner part of the pressure pump 16 and to the motor 6 driven by the pressure fluid from the said pump, sieves 19 and 20 are provided by means of which foreign matter such as sand or the like is separated from the liquid before being supplied to the pipe 17.

The liquid which is drawn in by the pressure pump 16 through the pipe 17 is forced under high pressure into the pipe 9 and through the latter into the port 8 of the motor located at the bottom of the well. Within the motor 6 it acts on the pistons 7 and is discharged into the passage 13. The piston drum 10 which is rotated by means of the

pressure medium acting on the pistons 7 drives the pistons 11 which act as the pistons of a pump and draw in by suction the liquid to be hoisted, such as brine, oil or the like, through the suction passage 12 and force the same into the passage 13. Within the latter the liquid is mixed with the liquid from the motor and the passage 21, and the whole mass is forced upwards through the tube 15. As the pressure medium for driving the apparatus is taken from the liquid which has already been hoisted, the liquid being hoisted is not mixed with a foreign liquid.

In the example shown in Fig. 2, the pump is constructed in the form of a screw pump 22 located in the lower part of the pipe 15'. The pipe 9' for supplying the pressure medium to the motor of the pump is located at the side of the pipe 15' through which the liquid is forced upwards, and it communicates through a port 8' with the working chamber of the pistons 7'. The discharge port 21' for the liquid from the motor is directed towards the bottom of the well 4', so that the liquid being discharged forms a strong jet for stirring the bottom of the well. The liquid to be hoisted is drawn into the pipe 15' through holes 23 made in the lower part of the pipe and it is forced upwards by means of a screw pump 22. The pressure liquid and the liquid being hoisted are mixed with each other at the bottom of the well and outside the pump.

The example shown in Fig. 3 is substantially the same as that described with reference to Fig. 2 and the same letters of reference have been used to indicate corresponding parts. In addition to the pump 22 a drill 24 is connected to the motor 6', 7', the said drill being located at the bottom end of the motor. While the whole apparatus remains in its position, the drill freely moves over the ground of the well, so that it does not act on the ground but stirs the liquid, and in other respects the apparatus has the same function as that described with reference to Fig. 2. However, if the apparatus is lowered, the drill works on the ground of the well 4, so that the drill is forced further downwards, while the pump remains in operation, so that the mass of sand or rock made loose by the drill is forced upwards together with the liquid. Also in this case the jet of the liquid which is discharged from the passage 21' has the function of stirring the ground.

The operation of our improved apparatus is economical, because the cost of the whole apparatus is low, the apparatus requires little attention by the operator, and comparatively little power. The motor is of the fluid-pressure type, by which is meant that the motor is driven by the pressure of a suitable fluid. Since the apparatus is de-

signed to be used in wells of the greatest depth which must be constructed with a small diameter, it must be most compact and of the smallest possible diameter. This requirement is met by arranging a motor of the fluid pressure type, a pump, and a drill in line above one another and their upright axes in line with one another and with the conduits for supplying the motive fluid to the motor and hoisting the liquid from the pump. As a motor of the fluid pressure type has a small diameter as compared to motors of other types, the apparatus can be used in wells of the smallest diameters. This arrangement is an important feature of our invention. Both the motor and the pump are valveless and their operation is, therefore, unaffected by the admixture of sand with the fluid, from which it results that a drill may be driven by the motor, in which case the pump co-operates with the drill to remove the matter which has been cut from the ground. The piston of the motor is rotary and of the bladed type and moves always in the same direction, the pressure transmitted by the fluid acting upon the exposed surface of the piston-blades 7 (or 7'). The hoisting operation is not affected by the composition of the liquid, which may or may not be free of sand, easily or difficultly fluent, and finally the depth and the diameter of the well are immaterial as far as usefulness of the apparatus is concerned, because the motor with rotating piston can operate under any high pressure corresponding to the depth of the well.

We claim herein as our invention:

1. In an apparatus for hoisting liquids such as oil, brine and the like, the combination with a motor of the fluid pressure type adapted to be placed at the bottom of the well, and a conduit for supplying a motive fluid to said motor, of a pump operatively connected with said motor, and a conduit connected with said pump for hoisting the liquid therethrough and disposed substantially parallel to said conduit for supplying a motive fluid to said motor, said motor and pump being disposed in line with said conduits and one behind the other in the direction of said conduits.

2. In an apparatus for hoisting liquids such as oil, brine and the like, the combination with a piston motor of the fluid pres-

sure type adapted to be placed at the bottom of the well, and a conduit for supplying a motive fluid to said motor, of a piston pump operatively connected with said motor, and a conduit connected with said pump for hoisting the liquid therethrough and disposed substantially parallel to said conduit for supplying a motive fluid to said motor, said motor and pump being disposed in line with said conduits and one behind the other in the direction of said conduits.

3. In an apparatus for hoisting liquids such as oil, brine and the like, the combination with a motor of the fluid pressure type, and a conduit for supplying a motive fluid to said motor, of a pump operatively connected with said motor, and a conduit connected with said pump for hoisting the liquid therethrough and disposed substantially parallel to said conduit for supplying a motive fluid to said motor, said motor and pump being disposed in line with said conduits and one behind the other in the direction of said conduits, and said motor having its fluid outlet directed substantially in line with and away from said conduits.

4. In an apparatus for hoisting liquids such as oil, brine and the like, the combination with a valveless motor of the fluid pressure type adapted to be placed at the bottom of the well, and a conduit for supplying a motive fluid to said motor, of a valveless pump operatively connected with said motor, a conduit connected with said pump for hoisting the liquid therethrough and disposed substantially parallel to said conduit for supplying a motive fluid to said motor, and a drill connected with said motor and pump and located in position for cutting the ground at the bottom of the well, said motor, pump, and drill being disposed in line with said conduits and one behind the other in the direction of said conduits, and said motor having its fluid outlet directed substantially in line with and away from said conduits.

In testimony whereof we hereunto affix our signatures in the presence of two witnesses.

MORITZ LOEWENTHAL.
FRITZ EGERSDÖRFER.

Witnesses:

WOLDEMAR HAUPT,
HENRY HASPER.