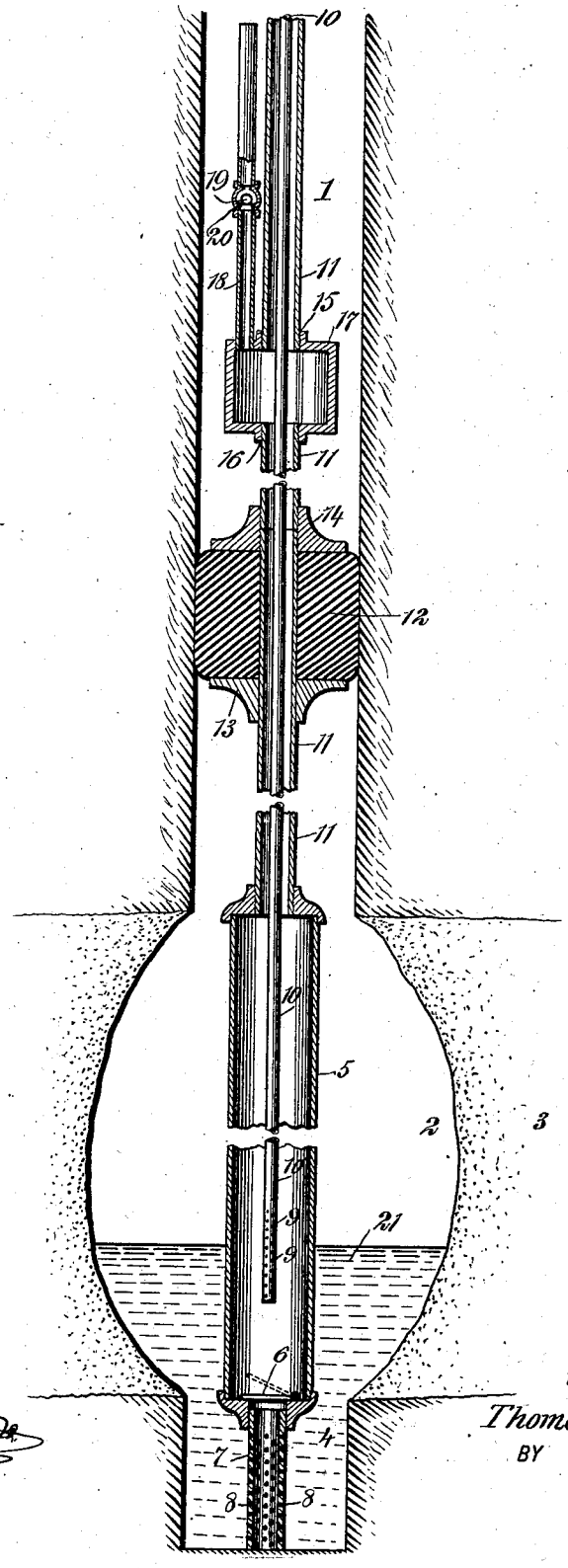
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T. F. MORAN.

DEVICE FOR RAISING LIQUIDS FROM WELLS.

APPLICATION FILED JULY 5, 1902.

NO MODEL.



WITNESSES:

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DEVICE FOR RAISING LIQUIDS FROM WELLS.

SPECIFICATION forming part of Letters Patent No. 721,594, dated February 24, 1903.

Application filed July 5, 1902. Serial No. 114,508. (No model.)

To all whom it may concern:

Be it known that I, THOMAS FRANCES MORAN, a citizen of the United States, and a resident of De Young, in the county of Elk and State of Pennsylvania, have invented new and useful Improvements in Devices for Raising Liquids from Wells, of which the following is a full, clear, and exact description.

My invention relates to mechanism for raising liquids, such as oil and water, from deep wells, more particularly oil-wells.

Reference is to be had to the accompanying drawing, forming a part of this specification, in which the figure represents a vertical section of an oil-well equipped with my device.

The drill-hole is shown at 1 and the cavity formed by the explosion of a dynamite cartridge and commonly designated as a "shot-hole" is shown at 2, being formed in the oil-sand 3. The bottom of the well terminates in a sort of basin 4, which may be a continuation of the drill-hole 1, if desired. A casing 5, provided with an upwardly-opening valve 6, is connected with a short section of pipe 7, which is provided with holes or perforations 8 as inducts for the oil or water accumulating in the bottom of the well. The air-pipe—that is to say, the pipe used for forcing compressed air down into the casing—is shown at 10 and is provided with perforations 9 in the usual manner. A larger pipe 11 circumscribes the air-pipe 10 and is used as a conduit for the oil or other liquid to be raised. An annular packing 12, preferably of rubber, is fitted upon the pipe 11 and is supported above and below by the flanges 13 14, being thus tightly squeezed in position, so as to form a gas-tight joint in the drill-hole. By means of the threaded connections 15 16 a hollow drum 17 is mounted upon the pipe 11, so as to constitute a virtual enlargement thereof, and connected with the drum 17 is a vertical stand-pipe 18, provided with a downwardly-opening valve 19, this valve being preferably an ordinary ball-valve provided with the usual spider 20.

The operation of my device is as follows: The oil-sand 3 normally contains both oil and natural gas and sometimes contains more or less water. These liquids are indicated at 21. The gas tends to escape constantly and in most oil-wells gradually works out into the shot-hole and follows the drill-hole to the surface of the ground, there making its escape. The object of the gas-tight packing 12 is to prevent the upward flow of the gas through the drill-hole, thereby causing an accumulation of gas in the upper portion of the shot-hole 2 and in the portion of the drill-hole immediately adjacent thereto and below the packing 12. Any oil, water, or other liquid which accumulates around and below the casing is forced by the gas-pressure through the apertures 8 and up into the casing and pipes 10 and 11 to an indefinite height above the bottom of the well. If the gas-pressure be considerable, as is sometimes the case, it may be sufficient to force the oil or water to the surface. In any event it is of more or less assistance in raising the liquid. Normally, however, it is unable to raise the liquid to the surface. The well is therefore "flowed" at intervals for the purpose of removing the oil, it being of course necessary to remove any water which may accumulate under the oil in the basin and around the casing. For the purpose of removing these liquids air is forced downward through the pipe 10 into the casing in the usual manner, and the oil or water is forced upward through the pipe 11. The drum 17 serves as a connection between the pipes 11 and 18. When the liquid reaches the level of the drum 17 and rises still higher, it enters the pipe 18. Owing to the slow rise of the liquid, it does not close the valve 19, but passes through the same, making its escape directly into the drill-hole 1, and thereby partially filling the drill-hole above the packing 2. The pressure of the column of liquid in the pipe 18 and drill-hole 1 does not increase the pressure of the column of liquid in the pipe 11, although the pipe 18 serves as a relief for the pipe 11. In other words, the pipe 11, drum 17, pipe 18, and drill-hole 1 will contain a larger quantity of liquid than the pipe 11 alone, yet the pressure per square inch of the liquid within the pipe 11 at a particular point is not affected, and the pressure of the actuating fluid required to empty the pipe 11 is not increased. When the air passes upward through the pipe 11, carrying the liquid to the surface of the earth, the valve 19 is closed by the ex-

cess of pressure in the lower part of the pipe 18, caused by the forcing of the air through the pipe 10 into the trap and the consequent lifting of the liquid in the pipe 11—that is to say, the pressure on the valve is greater while the air-pressure is being applied for the purpose of raising the liquid in the pipe 11. The liquid accumulated in the drill hole 1 above the valve 19 therefore does not require an increase of the air-pressure, and the pipe 11 is emptied as easily as would be the case if there were no pipe 18 or portions of the drill-hole 1 serving as a reservoir. As soon, however, as the pipe 11 is emptied of its contents, or at least the level of the liquid therein is greatly lowered, and the flow of air through the pipe 10 is stopped at will, the valve 19 is automatically opened by the downward pressure of the liquid stored in the upper portion of the drill-hole 1 and flows freely into the drum 17 and upward into the pipe 11 until it reaches the same level that it occupies in the drill-hole 1. The air-pressure now being again applied, the excess of liquid thus thrown into the pipe 11 is readily carried up to the surface. The well is emptied periodically by intermittently applying air-pressure and stopping the same. It will be seen, therefore, that by means of my device while the containing capacity of the well is increased the pipe 11 remains of the same size as before and the pressure due to the liquid within this pipe is not increased in the slightest, the principle being that the air-pressure required is dependent solely upon the depth of the column of liquid within the pipe 11 and need not be increased because of the presence of the liquid located outside of the pipe and within the drill-hole above the packing. It should be remembered in this connection that the capacity of the well cannot be increased by enlarging the pipe 11 unless the pipe 10 is likewise enlarged and, in fact, the entire mechanism of the well be made upon a larger scale. This normally necessitates the use of a larger and more powerful air-compressor, which must remain idle nearly all of the time. One result accomplished by my invention is to enable the use of a comparatively low air-pressure.

By an inspection of Fig. 1 it will be seen that the quantity of liquid required to fill the drill-hole 1 to a given depth above the packing 12 is considerably more than would be sufficient to fill the pipe 11 to the same height. This being so, it follows that if all of the liquid which may accumulate in the well from the natural or rock pressure is allowed to flow into the drill-hole 1 above the packing a much larger quantity of the liquid can be stored and made available for raising than if the liquid is merely allowed to rise in the pipe 11. In other words, the height to which the liquid will rise if allowed to flow freely into the drill-hole 1, as above described, is the same height which would be reached by the liquid if it were not so allowed to flow directly into the drill-hole 1, and yet the drill-hole is capable of containing a volume of liquid commensurate with a vastly-greater vertical length of the pipe 11 than would be normally filled by the rock-pressure.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A device for raising liquids from wells, comprising a pipe for conducting said liquids, a casing connected with said pipe and provided with inducts for admitting said liquids, a packing for preventing the escape of gases around said pipe, means for forcing air into said pipe, and for connecting said pipe with a reservoir for storing a quantity of liquid, thereby virtually increasing the capacity of said pipe.

2. A device for raising liquids from wells, comprising a pipe for conducting said liquids, a casing connected with said pipe and provided with inducts for admitting said liquids, means for forcing compressed air into said casing, and means for connecting said pipe with an underground reservoir.

3. A device for raising liquids from wells, comprising a pipe for conducting said liquids, a casing connected with said pipe and provided with inducts for admitting said liquids, means for forcing compressed air into said casing, and a reservoir consisting of a hollow drum connected with said pipe, and a standpipe connected with said drum, said standpipe being provided with a valve permitting the passage of the liquid in one direction only.

4. A device for raising liquids from wells, comprising a pipe, a casing connected therewith for admitting liquids thereinto, a packing engaging said pipe and also engaging the drill-hole, said packing being free to cause an accumulation of gas-pressure upon the liquid adjacent to said casing, mechanism provided with a valve for connecting said pipe with said drill-hole at a point above said packing, thereby using a portion of said drill-hole as a reservoir, and means for removing said liquids from said pipe.

5. A device for raising liquids from wells, comprising a pipe disposed within the drill-hole and smaller than the same, a packing engaging said pipe and said drill-hole, means for admitting a liquid to said pipe, said liquid being free to assume a level at an indefinite distance above said packing, mechanism for intermittently removing said liquids from said pipe, means for normally establishing hydraulic communication between said pipe and the drill-hole at a point above said packing for the purpose of using the portion of the drill-hole as a reservoir, and a valve for preventing the flow of said liquids from said reservoir into said pipe while said air-pipe is in action.

6. A device for raising liquids from wells, comprising a conducting-pipe disposed within the drill-hole and smaller than the same, a

casing connected with said pipe, a hydraulic connection between said pipe and said drill-hole, a pressure-controlled valve disposed within said hydraulic connection, a gas-tight packing engaging said pipe and said drill-hole, said packing being free to support a column of liquid within the upper portion of the drill-hole, and also to support the natural-gas pressure within the lower portion of said drill-hole, and means for removing said liquid from said pipe.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THOMAS FRANCES MORAN.

Witnesses:

FRANKLIN POTTER,

JNO. I. WATSON.