

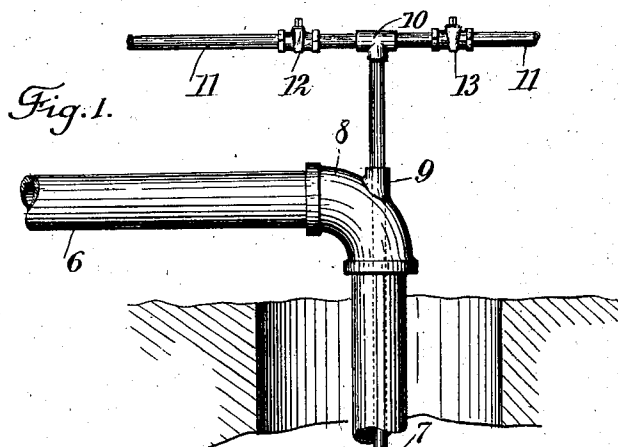
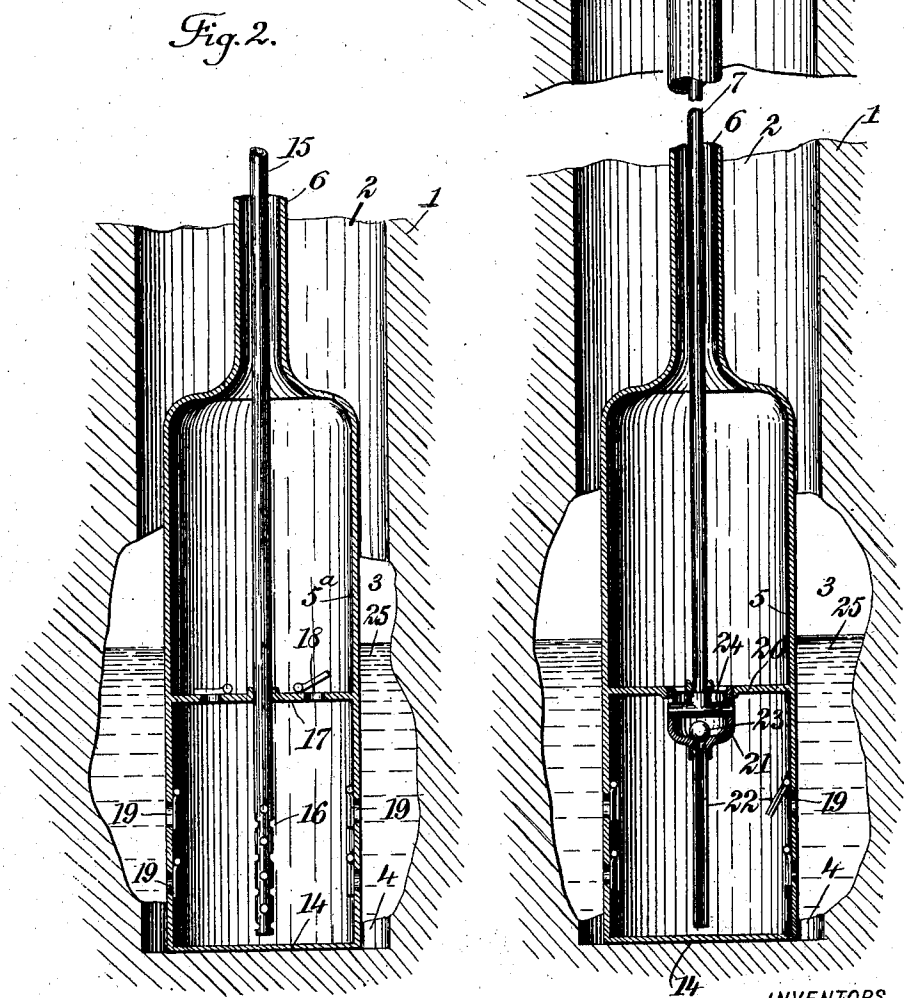
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T. F. MORAN & F. J. MOSER.
METHOD OF ELEVATING LIQUIDS FROM WELLS.

APPLICATION FILED SEPT. 5, 1903.

NO MODEL.



WITNESSES:

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THOMAS FRANCES MORAN, OF DE YOUNG, AND FRED JOSEPH MOSER,
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METHOD OF ELEVATING LIQUIDS FROM WELLS.

SPECIFICATION forming part of Letters Patent No. 751,323, dated February 2, 1904.

Application filed September 5, 1903. Serial No. 172,089. (No model.)

To all whom it may concern:

Be it known that we, THOMAS FRANCES MORAN, a resident of De Young, in the county of Elk, and FRED JOSEPH MOSER, a resident of Kane, in the county of McKean, State of Pennsylvania, both citizens of the United States, have invented a new and Improved Method of Elevating Liquids from Wells, of which the following is a full, clear, and exact description.

Our invention relates to the elevating of liquids from deep wells, and especially to such as are used in the oil regions and elsewhere.

In certain oil fields where the wells have been drilled for a long time—say fifteen years or more—many of the wells become exhausted of their gas-pressure, and the liquid does not have a tendency to rise to a sufficient height in the wells to enable it to be readily elevated—that is to say, in such wells there is not a sufficient natural depth of liquid to make a column of proper height to enable the air-pressure used in raising the liquid to be sufficiently sealed as to readily raise the column. In many such instances the distance from the upper level of the fluid to the bottom of the well is as small as twenty feet, although the depth of the well may be as much as two thousand feet. As it takes a certain depth of liquid above the point of air discharged to so effectively seal a charge of air in order to raise the liquid properly, it is plain that if the liquid is too shallow it cannot be raised from the well by the ordinary method of raising liquids by air.

The method involved in our present application constitutes a remedy which we have found for the shallowness of the liquid in the wells above referred to in order that the liquids may be readily raised by air.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in both figures.

Figure 1 is a vertical section through a well employing one form of apparatus for carrying out our method, and Fig. 2 is a fragmentary vertical section of the lower part of a well equipped with another form of apparatus for carrying out our method.

The ground is shown at 1, the drill-hole at 2, the shot-hole at 3, and the basin at 4. A tubular casing 5 of any desired length and adapted to seal a charge of air is connected with the tubing 6. An air-pipe 7 is surrounded partially by the tubing 6 and passes up through the elbow 8 by means of an air-tight joint 9, as indicated in Fig. 1. The upper end of the air-pipe 7 terminates in a T 10, which is connected with an air-supply pipe 11, provided with valves 12 13. The casing 5 is provided with a sealed bottom 14 and is air-tight.

In Fig. 2 the air-pipe 15 is of a form slightly different from that above described and is provided at its extreme lower end with perforations 16. The casing 5^a is provided with a bridge 17, this bridge having upwardly-opening valves 18, and the casings 5 and 5^a are further provided with inwardly-opening valves 19.

In Fig. 1 the casing 5 is provided with a bridge 20, this bridge having the form of a web and being provided with a cup 21, depending therefrom, and connected with the cup 21 and depending therefrom is a tube 22. A ball-valve 23 rests within the cup 21, which forms a seat therefor. A T 24 is mounted upon the lower end of the pipe 7 and its ends passed through the sides of the cup 21, being flush with the exterior thereof, as indicated in Fig. 1.

The liquid to be raised is shown at 25. Where the form of apparatus shown in Fig. 1 is employed, the liquid 25 enters the casing 5 through the valves 19. Any air that may be in the casing below the bridge or partition 20 is free to pass upward into the ends of the T 24, making its escape through the air-pipe 7, the valve 12 being open for the purpose. The liquid of course rises within the casing to a level equal to that of the liquid 25 outside of the casing. The valve 12 is now closed and the valve 13 opened for a moment. Air under pressure from the pipe 11 thence rushes through the air-pipe 7 and T 24, accumulating immediately below the bridge or partition 20. The pressure of this air upon any liquid contained within the lower part of the casing

causes the valves 19 to close should any of them chance to be open. The air-pressure, furthermore, causes the liquid in the lower part of the casing to be forced upwardly through the tube 22 and to lift the ball-valve 23. This valve cannot rise beyond a certain limit, owing to the presence of the T. The liquid passes around the ball-valve 23 and the T 24 into the upper part of the casing 5. The air-pressure being cut off by the valve 13, the weight of the liquid elevated into the upper portion of the casing 5, as just described, forces the ball-valve 23 upon its seat in the cup 21, thus preventing retrogression of the liquid and leaving a portion of the liquid in the casing 5 above the partition 20, the upper level of this portion of the liquid being considerably above that of the liquid 25 outside of the casing. Another portion of the liquid 25 now gravitates into the casing 5 at a point below the partition 20, whereupon air-pressure is again applied, as above described, elevating still another portion of the liquid from below the partition 20, so as to raise the level of the liquid above the partition 20 to a point still higher. This is repeated until a column of sufficient depth above the bridge is obtained to seal a discharge of air. A strong air-pressure is then applied by means of the valve 13, the air rushing down the air-pipe 7 through the T and upward through the tube 22 and cup 21. This last-mentioned charge of air is of such great pressure that it lifts all of the liquid in the lower chamber to the upper chamber and also lifts the column of liquid contained within the upper chamber and forces the same through the tubing 6, thereby elevating the aggregate column of liquid to the surface. It will be noted that owing to the great difference in diameter of the tubing 6 and casing 5 the column of liquid must necessarily become considerably elongated as it passes through the casing into the tubing, and this fact enables it to seal more effectively. Where the form shown in Fig. 2 is employed, the liquid 25 gravitates into the casing 5^a until it reaches a common level. A small charge of air is then admitted through the air-pipe 15 and escapes violently through the aperture 16, thereby suddenly expanding and producing an instantaneous pressure, which closes the valves 19 and elevates a portion of the liquid from the lower portion to the upper portion of the casing 5^a. The air-pressure being discontinued, the valve 18 closes suddenly and leaves the liquid resting upon the partition 17 and having an upper level considerably above that of the liquid 25. This step is repeated as often as desired and preferably until the upper portion of the casing 5^a is completely filled with the liquid. A strong air-pressure is then continuously applied, with the result that the liquid is elevated to the surface. In this case, as in the one described with reference to Fig. 1, the

column becomes elongated and more effectively seals the liquid for the purpose of enabling the same to be lifted.

It does not matter whether for the purpose of raising the liquid from the lower portion to the upper portion of the casing the several "lifts" be made at long intervals or at short intervals—that is to say, a number of such lifts may be made within a few minutes of each other if the shot-hole 3 contains a sufficient amount of liquid to justify the same. If, however, there is very little liquid within the shot-hole and the same accumulates very slowly, there is no objection to making one lift and then waiting several hours or even a day or two until the column of liquid within the shot-hole is increased and its level raised to a point where the lift can profitably be made. In any event it is desirable to make the lifts as often as the liquid within the casing reaches a fair depth.

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

1. The method of elevating liquids from wells, which consists in applying compressed air to a body of liquid separated from the main body of liquid in the well for the purpose of raising a portion of said liquid above the general level of the liquid within the well, preventing retrogression of the portion of liquid thus raised, lifting another portion of said liquid and merging the same with the first portion, preventing retrogression of the entire portion thus lifted so as to form a continuous column of comparatively great height, and finally raising the bulk of said column bodily upward to the surface of the earth by means of air at high pressure.

2. The method herein described of elevating liquids from wells, which consists in discharging into the liquid at a low point a quantity of air under pressure for the purpose of raising a portion of the liquid to a level above the general level of the liquid in the well, preventing retrogression of the portion thus raised for the purpose of virtually lengthening the depth of the liquid in a portion of the well, and applying air at high pressure for the purpose of bodily lifting the bulk of the column of liquid thus partially elevated to the surface of the earth.

3. The method herein described of elevating liquids from wells, which consists in applying a succession of air charges of comparatively short duration to the liquid for the purpose of forming the same step by step into a vertical column, and then applying a comparatively continuous charge of air at high pressure for the purpose of elevating bodily to the surface of the earth the bulk of the column thus formed.

4. The method herein described of elevating liquids from wells, which consists in successively applying compressed air to the liquid

for the purpose of raising, by comparatively short steps, a portion thereof, thereby causing the same to form a vertical column of comparatively great depth, and then applying compressed air beneath the column for the purpose of bodily elevating the bulk of the same to the surface of the earth.

5. The method herein described of elevating liquids from wells, which consists in causing a part of the liquid in the well to assume the form of a vertical column extending above the general level of the liquid, preventing retrogression of a portion thus raised, and liberating a gaseous medium under high pressure to said column at a point adjacent to the bottom thereof for the purpose of raising bodily the bulk thereof to the surface of the earth.

6. The method herein described of elevating liquids from wells, which consists in causing a part of said liquids to assume the form of a vertical column, the upper level of which is higher than the general level of liquid in the well, preventing retrogression of the liquid, and finally releasing compressed air within said column at a point adjacent to the bottom thereof, for the purpose of forcing the same through a contracted outlet, thereby causing

said column of liquid to become elongated and form a perfect seal.

7. The method herein described of elevating liquids from wells, which consists in applying compressed air to the liquid contained in a chamber for the purpose of elevating a portion of the same above the general level of the liquid in the well, preventing retrogression of the same, causing a portion of the main body of the liquid in the well to enter the partially-vacated chamber, preventing retrogression of the same, finally elevating the same and merging it with the first portion elevated, thereby forming a column of comparatively great depth, and forcing a volume of liquid, representing the bulk of said column, bodily upward to the surface of the earth by means of air applied at high pressure.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

THOMAS FRANCES MORAN.
FRED JOSEPH MOSER.

Witnesses:

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PEARLE JONES.