J. W. DARLEY, JR.

WELL PUMPING APPARATUS.

APPLICATION FILED DEC. 21, 1910. RENEWED MAR. 19, 1912.

1,042,204. Patented Oct. 22, 1912.

Fig. 1.

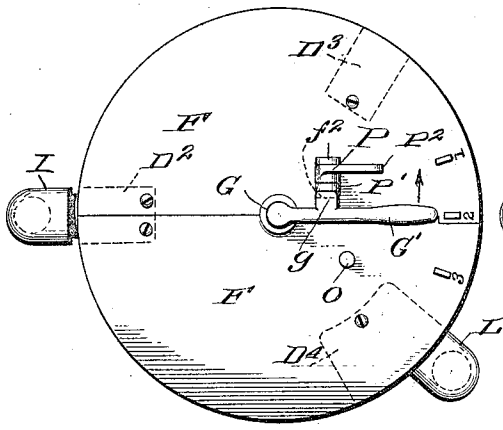


Fig. 3.

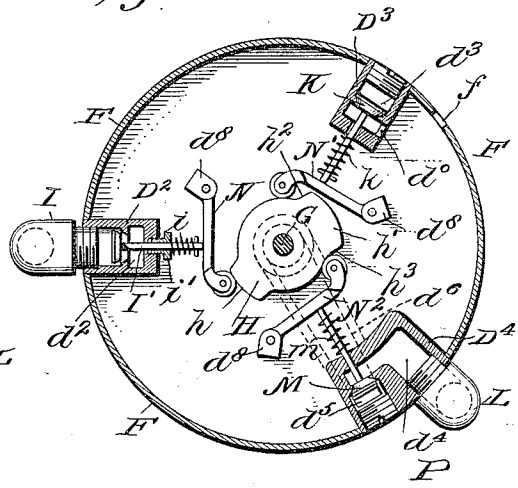


Fig. 2.

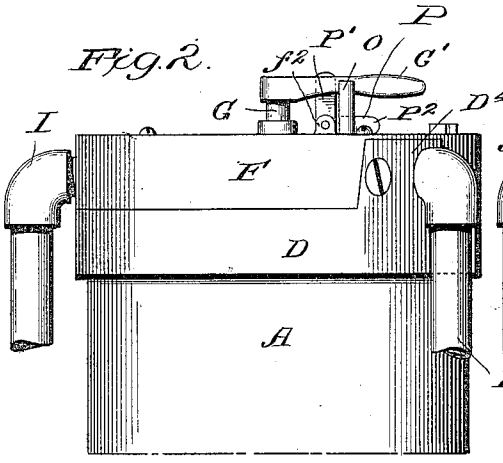
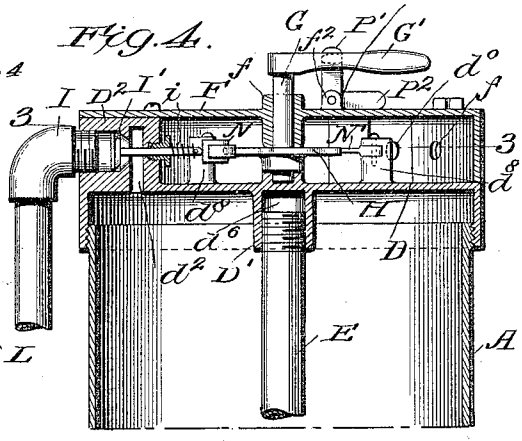
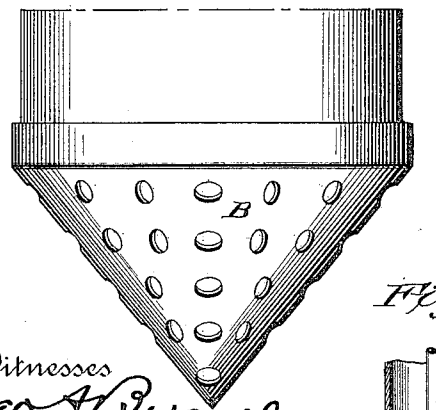


Fig. 4.





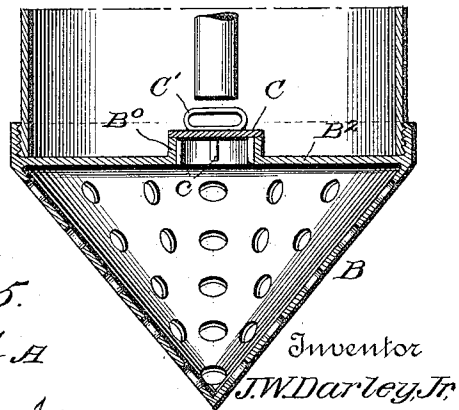
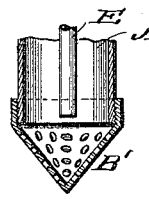


Fig. 5.



Witnesses

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UNITED STATES PATENT OFFICE.

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WELL-PUMPING APPARATUS.

1,042,204. Specification of Letters Patent. Patented Oct. 22, 1912.

Application filed December 21, 1910, Serial No. 598,535. Renewed March 19, 1912. Serial No. 684,814.

To all whom it may concern:

Be it known that I, JOHN W. DARLEY, Jr., a citizen of the United States, residing at Baltimore, State of Maryland, have invented certain new and useful Improvements in Well-Pumping Apparatus, (Case A;) and I 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.

My present invention relates to improvements in apparatus for pumping liquids from wells by the use of compressed air and it is more especially intended for use in driven wells which are provided with a cylindrical metal shell which will prevent the escape of the air or water into the earth during the operation of pumping.

My invention will be understood by reference to the accompanying drawings in which the same parts are indicated by the same letters throughout the several figures.

Figure 1 is a plan view of the top of the well with a cap mounted thereon; Fig. 2 is a side elevation showing the tube removed from the ground, parts being broken away; Fig. 3 shows a section along the line 3—3 of Fig. 4 and looking down; Fig. 4 shows a vertical section through the apparatus, parts being shown in elevation; and Fig. 5 shows a modification omitting the diaphragm from the perforated cone.

A represents the cylindrical shell of the well which is provided with a perforated cone B secured thereon. This cone is provided with a diaphragm B^2 perforated as at B^0 and flanged upward to form a seat for the valve C, which valve is preferably provided with a loop C′ so that it may be lifted out with a wire hook, if desired. This valve has guides c projecting down into the opening B^0 and the valve is prevented from being lifted clear of its seat by the lower end of the pipe E which is secured into the socket D′ of the head D. This head is preferably made in the form of a casting with a series of lugs, D^2, D^3 and D^4 with passages in said lugs, d^2, d^3, and d^4 and d^5, and is also provided with lugs d^8 and with passages d^6, see Figs. 3 and 4; and with an exhaust opening d^0. The cap or cover F is preferably made in two parts provided with a bearing f for the shaft G. The two parts of this cover fit down over the lugs D^2, D^3, and D^4 of the head and are secured to said head in any suitable way as by tap bolts or screws. The cap is also preferably provided with an exhaust opening f. The shaft G is fast to the handle G′ and is provided with a lug g. This shaft carries the cam plate H having two oppositely disposed cams h and h', the latter of which is provided with cam faces h^2 and h^3.

I represents a pipe for supplying compressed air, and I′ represents a valve controlling the same, which valve is normally held on its seat by the spring i. The valve stem of this valve passes through a stuffing box i'.

K represents a valve connected to the exhaust, which valve is normally held on its seat by the spring k. This valve controls the escape of air from the passage d^3, to the exhaust opening d^0, and the opening f in the cap, as shown in Fig. 3. This exhaust passage d^3 opens through the bottom of the head into the annular space between the pipe E and the shell A similar to the opening d^2 shown in Fig. 4.

M represents a valve for controlling the flow of liquid, and this is normally pressed on its seat by the spring m. The liquid comes up through the pipe E into the passage d^6, see Figs. 3 and 4, which is connected by the passage d^5 to the passage d^4, both in the lug D^4 from which passage d^4 the liquid delivery pipe L carries off the liquid forced up by the compressed air in the well.

N, N′ and N^2 are three arms pivoted to the lugs d^8, carrying at their free ends antifriction rollers engaging the cam plate H. These arms engage the ends of the several valve stems as shown in Fig. 3.

O is a stop fast to the cap F.

P represents a bell crank lever pivoted between the lugs f^2, and having two arms P′, and P^2 adapted to engage the lug g on the handle G′. These arms P′ and P^2 are set in different planes as seen in Fig. 1, so that if the arm P′ is turned to a vertical position the handle can only be turned in the direction of the arrow in Fig. 1, as far as the index 2. If the arm P^2 is turned to a vertical position, then the handle G′ may be moved still farther over to the index 1, while the movement of the handle G′ in the opposite direction is limited by the stop O and the handle then points at the index 3. In the position shown in Figs. 1 and 2 corresponding to the second position of the han-

dle, the air pressure is turned on to the well but the liquid delivery connection is closed. Now if it is desired to cause the liquid to flow, turn the handle G′ to the position 3. This will cause the cam face h^3 to press back the arm N^2 pressing back the valve M and allowing the liquid to flow from the well. If it is desired to maintain the pressure and have the liquid always ready to flow, but not flowing, turn back the handle to the second position.

The diaphragm B^2 and the valve C at the face of the well will prevent the liquid that has seeped into the cylinder A from being forced back into the earth again by the air pressure in the well. After the chamber A has been emptied of the liquid below the lower end of the pipe E, if it is desired to allow the liquid to flow in again from the earth, turn the handle G′ to the position 1. This will cause the valve I′ to be released and it will snap to on its seat, while the cam face h^2 will push back the arm N′ and will open the exhaust valve K, when the air will flow up through the passage d^3 to the exhaust port d^0 and into the chamber in the cap F, from which chamber it will escape through the opening f, and any cracks that may be in said cap or in the joints between said cap and the head D. When the air pressure is relieved, the hydrostatic pressure of the liquid in the well will lift the valve C and liquid will flow into the chamber A, from which it may be pumped out by the compressed air as before explained.

It will be noted that the air pressure is entirely cut off from the liquid below the diaphragm B^2 whenever the air pressure is turned on to the chamber A, unless the hydrostatic pressure below said diaphragm exceeds the air pressure above the same, in which case the valve C will be lifted and liquid will flow into the chamber A in spite of said air pressure. It will also be noted that a single movement of the handle G′ from the exhaust position will first turn on the air and then both air and liquid; while a partial movement in the reverse direction will cut off the delivery of liquid but will leave on the air, and a further movement of the handle will cut off the air pressure and open the exhaust.

The bell crank lever P is normally set with the arm P′ vertical to provide against the accidental turning of the handle G′ to the position 1, in which position the compressed air is allowed to escape from the well.

It will be noted that the only valve stem that requires any packing is that of the valve I′. It will be seen that the handle G′ will remain at any one of the three positions 1, 2 or 3 in which it is put, since the rollers bear radially on the cam plate H and there is no tendency of any of the valve springs to swing said cam plate. If desired, however, a positive lock can be provided for each position of the handle G′.

In the modification shown in Fig. 5 the diaphragm is omitted from the top of the perforated cone and the said cone D′ opens directly into the chamber A. In this form of device the air pressure is turned off while the liquid is seeping in, and is turned on when it is desired to pump out said liquid. I ordinarily prefer, however, to use a perforated cone with the diaphragm as shown in Fig. 4.

It will be evident that various modifications might be made in the herein described apparatus without departing from the spirit of my invention.

Having thus described my invention what I claim and desire to secure by Letters Patent of the United States is:

1. A well pumping apparatus, comprising an outer tube adapted to admit liquid at its lower end, a cap normally closing the upper end of said tube and provided with an air inlet port, and with an air exhaust port, connected to the interior of said outer tube, and with a liquid delivery passage, an inner tube connected at its upper end with said liquid delivery passage and projecting downward into said outer tube, valves controlling said liquid delivery passage and said air and exhaust ports, respectively, and a hand operated cam arrangement for controlling said valves, substantially as described.

2. A well pumping apparatus comprising an outer tube adapted to admit liquid at its lower end, a cap normally closing the upper end of said tube and provided with an air inlet port, and with an air exhaust port, connected to the interior of said outer tube, and with a liquid delivery passage, an inner tube connected at its upper end with said liquid delivery passage and projecting downward into said outer tube, valves controlling said liquid delivery passage and said air and exhaust ports respectively, and a cam plate pivoted in said cap and adapted to open either said air valve alone, or both said air valve and said liquid, or said exhaust valve alone, substantially as described.

3. A well pumping apparatus comprising an outer tube adapted to admit liquid at its lower end, a cap normally closing the upper end of said tube and provided with an air inlet port, and with an air exhaust port connected to the interior of said outer tube, and with a liquid delivery passage, an inner tube connected at its upper end with said liquid delivery passage and projecting downward into said outer tube, valves controlling said liquid delivery passage and said air and exhaust ports respectively, and a cam plate pivoted in said cap and adapted to open either said air valve alone, or both said air and said liquid, or said exhaust valve alone,

a handle for turning said cam plate, and a bell crank lever pivoted contiguous to said handle and having its arms in different planes, whereby said lever arms form successive stops for said handle, substantially as described.

4. A well pumping apparatus, comprising an outer tube, a perforated inverted hollow cone secured to the lower end thereof, and adapted to admit liquid at its lower end, a cap normally closing the upper end of said tube and provided with an air inlet port, and with an air exhaust port connected to the interior of said outer tube, and with a liquid delivery passage, an inner tube connected at its upper end with said liquid delivery passage and projecting downward into said outer tube, valves controlling said liquid delivery passage and said air and exhaust ports respectively, and a hand operated cam arrangement for controlling said valves, substantially as described.

5. A well pumping apparatus comprising an outer tube adapted to admit liquid at its lower end, a cap normally closing the upper end of said tube and provided with an air inlet port and with an air exhaust port connected to the interior of said outer tube, and with a liquid delivery passage, an inner tube connected at its upper end with said liquid delivery passage and projecting downward into said outer tube, a diaphragm in the base of said perforted hollow cone provided with a passage therethrough for the liquid, and a valve opening upward and normally closing said passage when the air pressure is on, valves controlling said liquid delivery passage and said air and exhaust ports, respectively, and a hand operated cam arrangement for controlling said valves, substantially as described.

6. A well pumping apparatus comprising an outer tube adapted to admit liquid at its lower end, a cap normally closing the upper end of said tube and provided with an air inlet port, and with an air exhaust port connected to the interior of said outer tube, and with a liquid delivery passage, an inner tube connected at its upper end with said liquid delivery passage and projecting downward into said outer tube, a diaphragm in the base of said perforated hollow cone provided with a passage therethrough for the liquid, and a valve opening upward and normally closing said passage when the air pressure is on, valves controlling said liquid delivery passage and said air and exhaust ports, respectively, and a cam plate pivoted in said cap and adapted to open either said air valve alone, or both said air and said liquid, or said exhaust valve alone, substantially as described.

7. A well pumping apparatus, comprising an outer tube adapted to admit liquid at its lower end, a cap normally closing the upper end of said tube and provided with an air inlet port, and with an air exhaust port connected to the interior of said outer tube, and with a liquid delivery passage, an inner tube connected at its upper end with said liquid delivery passage and projecting downward into said outer tube, a diaphragm in the base of said perforated hollow cone provided with a passage therethrough for the liquid, and a valve opening upward and normally closing said passage when the air pressure is on, valves controlling said liquid delivery passage and said air and exhaust ports, respectively, and a cam plate pivoted in said cap and adapted to open either said air valve alone, or both said air and said liquid, or said exhaust valve alone, a handle for turning said cam plate, and a bell crank lever pivoted contiguous to said handle and having its arms in different planes, whereby said lever arms form successive stops for said handle, substantially as described.

8. A well pumping apparatus, comprising an outer tube a perforated inverted hollow cone secured to the lower end thereof, and adapted to admit liquid at its lower end, a cap normally closing the upper end of said tube and provided with an air inlet port, and with an air exhaust port connected to the interior of said outer tube, and with a liquid delivery passage, an inner tube connected at its upper end with said liquid delivery passage and projecting downward into said outer tube, a diaphragm in the base of said perforated hollow cone provided with a passage therethrough for the liquid, and a valve opening upward and normally closing said passage when the air pressure is on, valves controlling said liquid delivery passage and said air and exhaust ports, respectively, and a hand operated cam arrangement for controlling said valves, substantially as described.

In testimony whereof, I affix my signature, in the presence of two witnesses.

JOHN W. DARLEY, JR.

Witnesses:
E. H. DARLEY,
L. A. DARLEY.