July 9, 1935. J. A. COY ET AL 2,007,745

LIQUID LIFTING DEVICE

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Fig. 1.

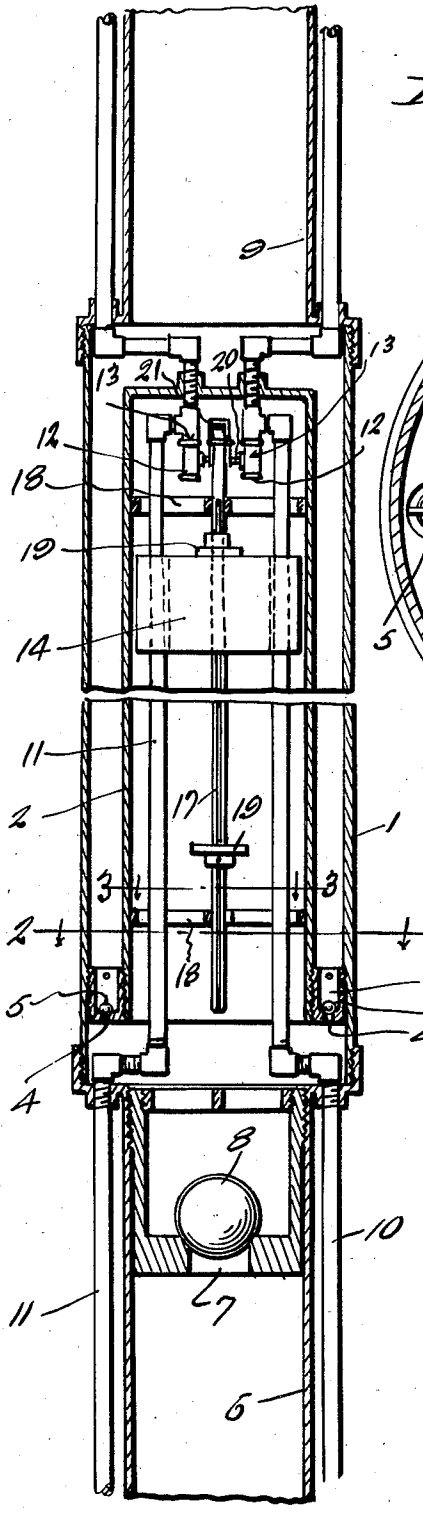


Fig. 2.

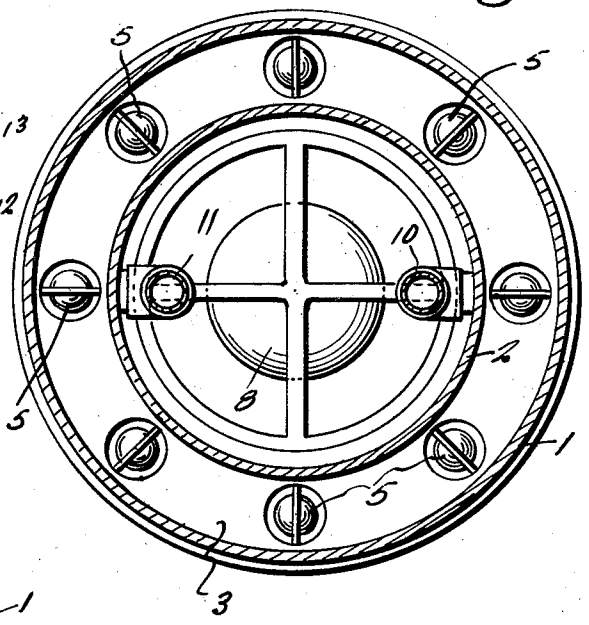
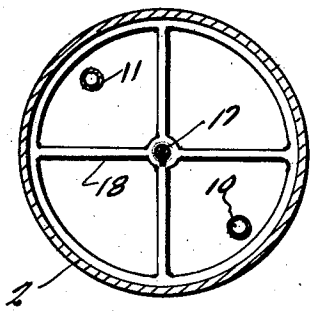


Fig. 3.



Inventor

Joseph A. Coy

Robert W. Drake

By Clarence A. O'Brien

Attorney

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Fig. 4.

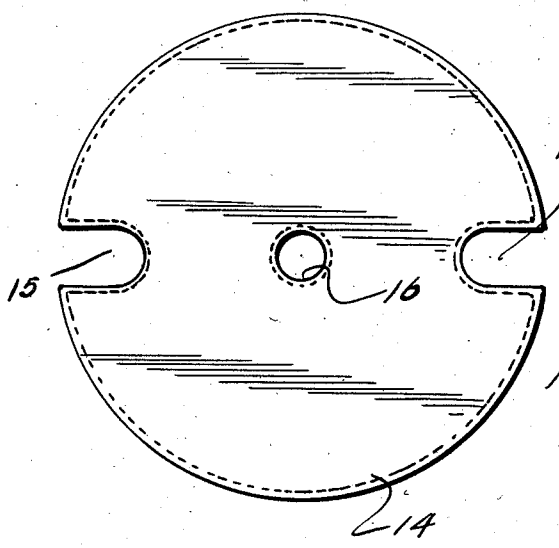


Fig. 5.

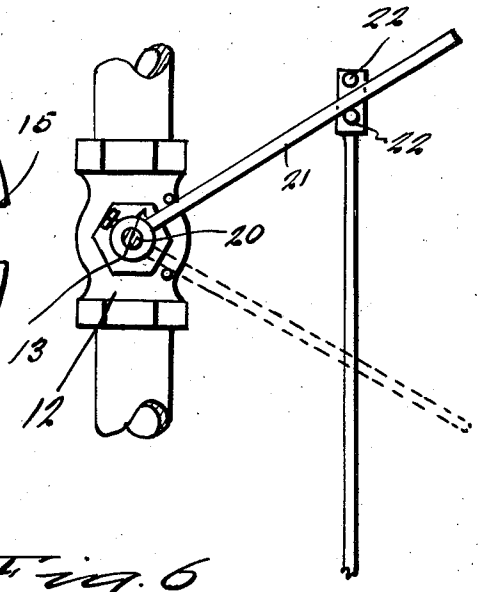
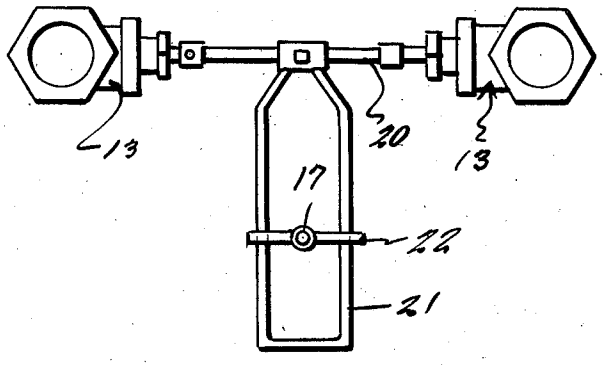


Fig. 6



Inventors

Joseph A. Coy.

Robert W. Drake

By Clarence O'Brien

Attorney

Patented July 9, 1935 2,007,745

UNITED STATES PATENT OFFICE

2,007,745

LIQUID LIFTING DEVICE

Joseph A. Coy and Robert W. Drake, Oklahoma City, Okla.

Application August 27, 1934, Serial No. 741,689

2 Claims. (Cl. 103—248)

This invention relates to a liquid lifting device, mainly designed for lifting liquids out of a well, the general object of the invention being to provide means operated by relatively low fluid pressure for lifting the liquid, through means of a liquid operated float provided with means for controlling the flow of fluid pressure.

The invention also consists in certain other features of construction and in the combination and arrangement of several parts, to be hereinafter fully described, illustrated in the accompanying drawings and specifically pointed out in the appended claims.

In describing the invention in detail, reference will be had to the accompanying drawings wherein like characters denote like or corresponding parts throughout the several views, and in which:—

Fig. 1 is a longitudinal sectional view through the invention.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a section on line 3—3 of Fig. 1.

Fig. 4 is a top plan view of the float.

Fig. 5 is an elevation showing the valve operating means.

Fig. 6 is a top plan view of Fig. 5.

In these drawings, the numeral 1 indicates a cylinder and the numeral 2 indicates a smaller cylinder located in and spaced from the cylinder 1 and having its upper end closed and its lower end open, a channel ring 3 being placed between the lower end of the cylinder 2 and a lower part of the cylinder 1. This ring has a plurality of ports 4 in its bottom part, each of which is controlled by a valve 5 which normally closes the port 4. An inlet pipe 6 is connected to the lower end of the cylinder 1 and contains a port 7 controlled by a ball valve 8 and a pipe 9 is connected to the upper end of the cylinder 1. The numeral 10 indicates a fluid pressure line while the numeral 11 indicates a vent line, portions of these lines passing through the chamber formed by the cylinder 2. In the upper part of this chamber, each of the lines 10 and 11 is provided with a discharge 12 controlled by a valve 13 so that when the valve is open, the lines will be in communication with the top of the chamber formed by the cylinder 2.

A float 14 has notches 15 therein through which parts of the lines 10 and 11 pass so that the float is guided by said parts and the float is provided with a centrally arranged hole 16 through which passes rod 17. The rod is guided for vertical movement in the upper and lower spiders 18 arranged in the cylinder 2 and said rod is keyed to said spiders so that the rod is prevented from having rotary movement. The rod carries the upper and lower disks 19 which form stops for the float so that when the float strikes a disk, the rod will be caused to move with the float.

The valves 13 are connected together by a stem 20 which is so connected with the valves that when the rod is turned in one direction, one valve will be open and the other closed and vice versa. A yoke 21 is connected with the rod and has its limbs passing between the upper and lower pairs of pins 22 carried by the upper end of the rod 17.

As will be seen, water or other liquid rising in the pipe 6 will flow past the valve 8 into the cylinder 2 and thus lift the float 14. When the float strikes the upper disk, the rod 17 will move with the float and thus cause the yoke 21 to turn the rod 20 so as to close the valve 13 in the vent pipe 11 and open valve 13 in the pressure line 10. Thus, compressed air or gas will pass from the line 10 into the upper part of the chamber formed by the cylinder 2 and this pressure will force the liquid from the chamber past the valves 5 into the chamber formed between the cylinders 1 and 2 into the pipe 9. As the level of the liquid drops in the cylinder 2, the float of course will drop until its strikes the lower disk 19 and then the rod 17 moves downwardly so as to cause the yoke to turn the valve rod 20 to close the pressure valve and open the vent valve so that the fluid pressure can escape from the chamber formed by the cylinder 2. Thus, the flow of liquid into the chamber again takes place which raises the float and thus the action is repeated.

As many of these devices are placed in a well or the like as desired, Fig. 1 showing the pipes 10 and 11 extended so that by connecting several of these devices, a definite distance apart and operating them in series, relaying liquid from one to another, liquid can be lifted from any depth to the surface with only enough air or gas pressure to operate the top mechanism. The same air or gas pressure is supplied to each mechanism as the liquid is lifted out of the top one, to the surface, the next located below will be the first supplied with successive discharge. The same operation will be repeated clear on down to the last one.

Any suitable means may be used for operating the valves from the float drop. For instance, a toggle arrangement may be used for imparting movement to the valves from the float drop.

It is thought from the foregoing description that the advantages and novel features of the invention will be readily apparent.

It is to be understood that changes may be made in the construction and in the combination and arrangement of the several parts, provided that such changes fall within the scope of the appended claims.

We claim:—

1. A liquid lifting device comprising a chamber-forming member, a cylinder surrounding the same and spaced therefrom, the lower end of the chamber-forming member being open at the bottom and its upper end closed, and said lower end being spaced from the lower end of the cylinder, a pipe connected to the lower end of the cylinder and extending into a supply of liquid, a downwardly closing check valve for said pipe, check valves closing downwardly and by which the liquid from the lower end of the cylinder enters the space between the chamber-forming member and said cylinder, a discharge pipe connected to the upper end of the cylinder, vent and pressure line pipes having portions passing through the chamber-forming member and each having a port opening into the top part of the chamber-forming member, a valve controlling these parts, a float in the chamber-forming member guided by the aforesaid vent and pressure line pipes, and means operated by the movement of the float for actuating the valves.

2. A liquid lifting device for incorporation between casing sections in a well comprising an outer cylinder, a valve controlled inlet conductor connected with the bottom of the outer cylinder, an outlet conductor connected with the top of the cylinder, a tubular chamber-forming member confined within the outer cylinder and spaced from the walls thereof to provide an outer and inner chamber, said chamber-forming member closed at the top and open at the bottom, downwardly closing check valves between the open end of the chamber-forming member and the outer chamber, vent and pressure line pipes having portions passing through the chamber-forming member and each having a discharge port opening into the top of the chamber-forming member, a valve in each of the vent and pressure discharge ports, a float confined within the chamber-forming member and in the inner chamber slidably arranged on the vent and pressure line pipes and a rod actuated by the float and connected with the valves for alternately closing one valve and opening the other.

JOSEPH A. COY.
ROBERT W DRAKE.