No. 847,433. PATENTED MAR. 19, 1907.

B. OBEAR.

AIR LIFT PUMP.

APPLICATION FILED MAY 14, 1906.

Fig. 1.

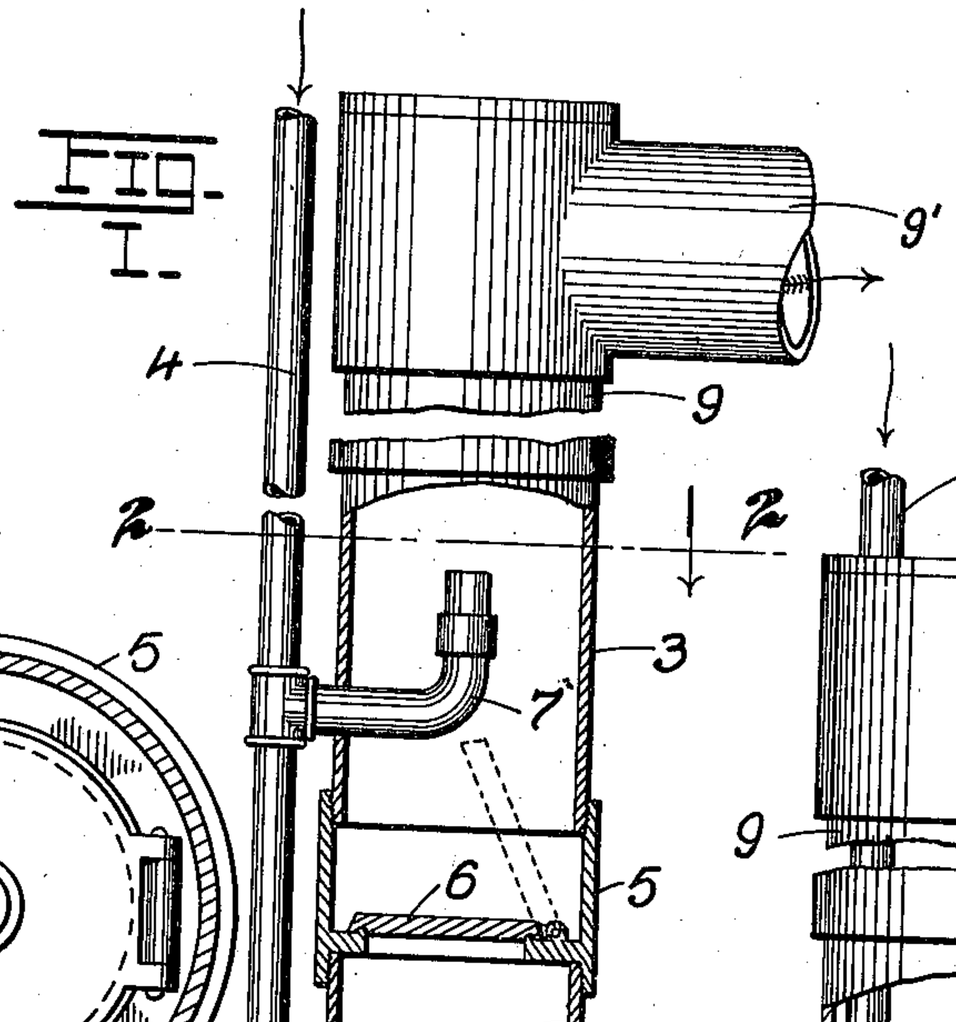

Fig. 2.

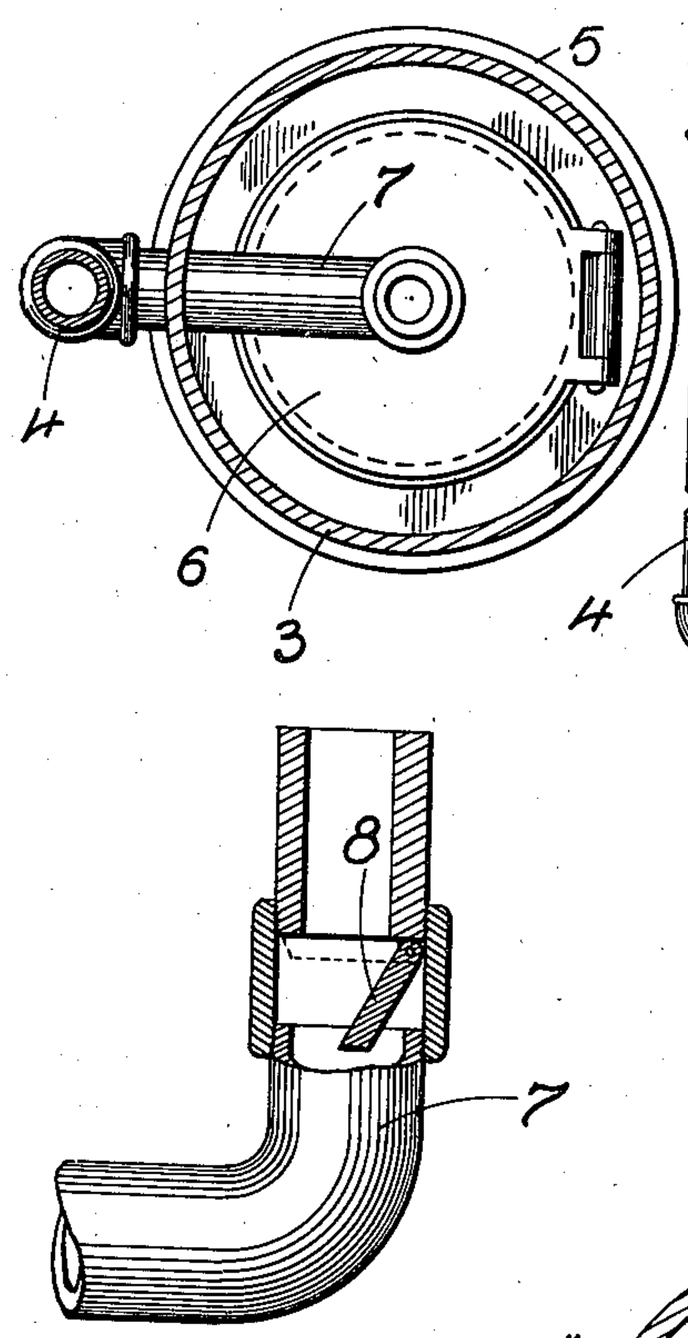

Fig. 3.

Fig. 5.

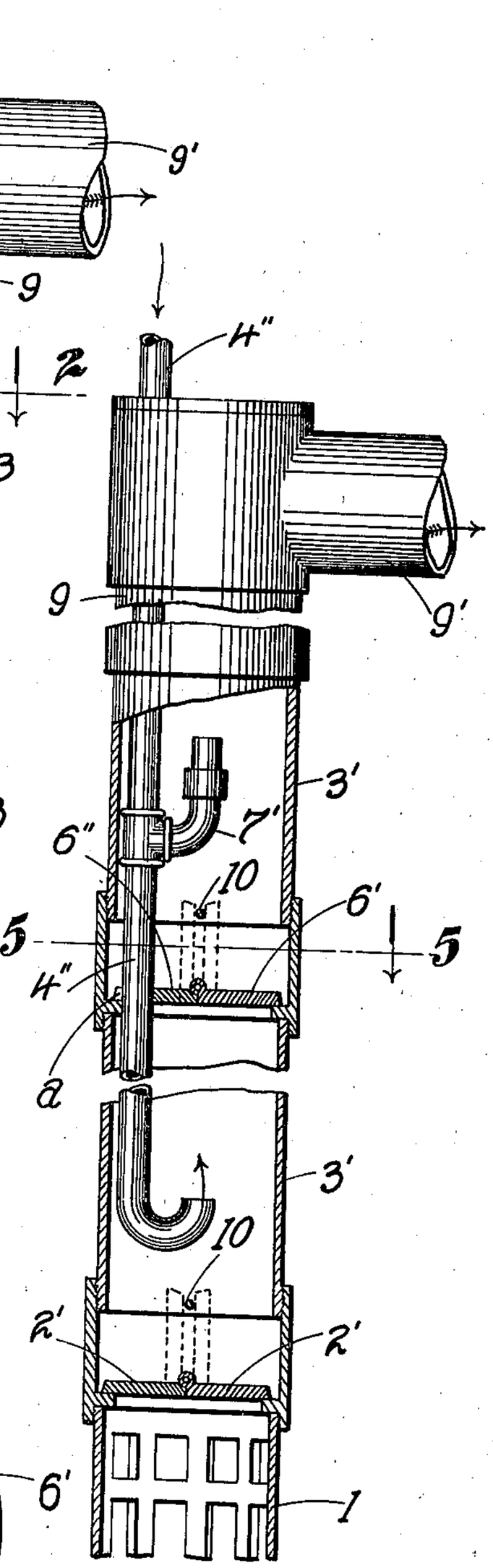

Fig. 4.

WITNESSES:

Phil. J. Dawn

Jos. A. Michel

INVENTOR.

Bryan Obear

BY Edwin Farnham

ATTORNEY.

UNITED STATES PATENT OFFICE.

BRYAN OBEAR, OF ST. LOUIS, MISSOURI, ASSIGNOR TO MONTAGUE COMPRESSED AIR COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

AIR LIFT-PUMP.

No. 847,433. Specification of Letters Patent. Patented March 19, 1907.

Application filed May 14, 1906. Serial No. 316,872.

To all whom it may concern:

Be it known that I, BRYAN OBEAR, a citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Air Lift-Pumps, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in air lift-pumps; and it consists in the novel construction and arrangement of parts more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a combined vertical section and elevation of one form of my pump. Fig. 2 is a transverse section on line 2 2 of Fig. 1. Fig. 3 is a sectional detail of the air-check valve. Fig. 4 is a combined vertical section and elevation of a modified form of pump, and Fig. 5 is a cross-section on ine 5 5 of Fig. 4.

The present invention is a qualification of the construction of pump shown and described in my pending application, Serial No. 295,298, said pending application covering a cylinder to the bottom of which leads a compressed-air pipe, the top of the cylinder communicating with a discharge-pipe located adjacent thereto and in which an induced current is formed above the point where the cylinder discharges its water thereinto, and while contemplating the several objects and advantages of said construction the present pump is more particularly adapted for deep wells of small cross-sectional diameter and also for pumping liquids or water at a low pressure and with a comparatively small submergence.

A further object is to materially simplify the pending construction, all as will be more fully apparent from a detailed description of the invention, which is as follows:

Referring to the drawings, and particularly to Figs. 1 to 3, inclusive, 1 represents a grated intake submerged below the surface of the water, (or other liquid,) the top of the intake being closed by a gate-valve 2, past which the water under the action of gravity is allowed to flow into the pump-cylinder 3. Leading to the bottom of the pump-cylinder through the peripheral walls thereof and discharging thereinto in an upward direction at a point immediately above the valve 2 is a compressed-air pipe 4, which is continued upwardly to any suitable source of compressed-air supply. (Not shown.) Located in the cylinder 3, and preferably carried by the coupling or union 5, by which the two sections of the cylinder are connected, is a hinged check-valve 6. Leading through the wall of the cylinder at a point above the check-valve is a branch pipe 7, whose discharge end is provided with an air-check valve 8, preferably of the hinged type, as shown, Fig. 3. Coupled to the top of the cylinder is the conducting or discharge pipe 9, whose top may be closed and provided with a branch 9′ for conveying the water to any suitable point.

The operation of the pump may be described as follows: The cylinder 3 being submerged to a point above the valve 2 (or any point above said valve) water will flow into the cylinder past the valve 2, as is obvious, the air above the water freely escaping past the check-valve 6 or for a shallow submergence simply compressing beneath the check-valve. Compressed air being now conducted through the pipe 4 will force the air-valve 8 to its seat, (dotted position, Fig. 3,) the air under compression escaping in an upwardly-directed jet through the terminal elbow or gooseneck 4′ of the pipe 4, Fig. 1, such jet drawing (by the current induced thereby) the water accumulated in the cylinder and carrying the column of water past the valves 2 and 6 through the cylinder and through the discharge-pipe 9 9′. As the static head of the column of water in the cylinder 3 and pipe 9 overcomes or equals the driving pressure of air impelling it the valves 6 and 2 close, leaving a column of water resting on the valve 6. At the same time the air-valve 8 opens by its own weight, owing to the equilibrium of the forces thus established. This equilibrium and the rest accorded to the rising column of water is momentary only, and almost immediately thereafter the compressed-air current in the pipe 4 again closes or seats the valve 8, establishes a fresh jet through the discharge end of the gooseneck 4′, establishing a newly-induced current, drawing up a fresh quantity of liquid whose momentum again raises the valves 2 and 6 and impels forward the column previously temporarily supported on the check-valve 6. This continues until another moment of

equilibrium is established, and the process is continued indefinitely until all the water is pumped out. I may in this way overcome an abnormal static column or head by a comparatively low pressure by reason of the establishment of the succession of equilibriums referred to. In lieu of passing the air-pipe 4 on the outside of the pump-cylinder I may pass it on the inside, as shown by pipe 4″ in Figs. 4 and 5. Like the pipe 4 the pipe 4″ is provided with a branch 7′, having an air-valve. So, too, in lieu of a single intake-valve 2 I may provide two valves 2′ 2′, pivoted at the center of the pump-cylinder 3′, each valve being limited or arrested in its upward swing by a cross rod or bar 10, and in lieu of a single check-valve 6 I may provide two valves 6′ 6″, the latter having a section *a* excised therefrom, so as to close over the pipe 4″ when in its seated position. The parts 1 and 9 9′ are the same as in the main form of my invention.

It will be seen that the discharge end of the compressed-air pipe directs its air-jet toward the discharge end of the cylinder 3 or pipe 9, so that the induction of the resulting current by which the ascending column of water is established is virtually in the line of the axis of such cylinder, and the best possible results are thus attained. The presence of the valve 8 in the branch 7 of course permits (before the pressure of air has reached a point where it seats said valve) a current of air to escape into the cylinder, thus supplementing in a measure the induction resulting from the gooseneck 4′. The discharge of water by the present pump when once started is practically continuous.

Having described my invention, what I claim is—

1. In an air lift-pump, a suitable pump-cylinder, means for admitting thereinto the liquid to be pumped, a pipe leading into said cylinder and discharging air under pressure in a jet directed toward the discharge end of the cylinder, a check-valve located in the cylinder above the discharge end of the air-pipe, a branch leading into the cylinder from the air-pipe above the check-valve, a valve in said branch normally closed when said check-valve is open, and a suitable intake for the cylinder, substantially as set forth.

2. In an air lift-pump, a suitable pump-cylinder, means for admitting thereinto the liquid to be pumped, a pipe leading into said cylinder and discharging air under pressure in a jet directed parallel to the axis of the cylinder and toward the discharge end thereof, a check-valve located in the cylinder above the discharge end of the air-pipe, a branch leading into the cylinder from the air-pipe above the check-valve, an air-valve in said branch adapted to close under the air-pressure therein, and an intake-valve for admitting the liquid into the cylinder, substantially as set forth.

3. In an air lift-pump, a suitable pump-cylinder, means for admitting thereinto the liquid to be pumped, means for delivering air under pressure into the cylinder, a check-valve above the point of admission of the compressed air into the cylinder, an intake-valve below the point of admission of the air into the cylinder, a branch pipe leading from the source of compressed-air supply into the cylinder at a point above the check-valve aforesaid; and a compressed-air-controlled check-valve operating in an opposite direction from the aforesaid-mentioned valves, located in said branch pipe, substantially as set forth.

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

BRYAN OBEAR.

Witnesses:

EMIL STAREK,

JOS. A. MICHEL.