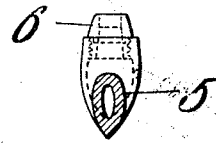
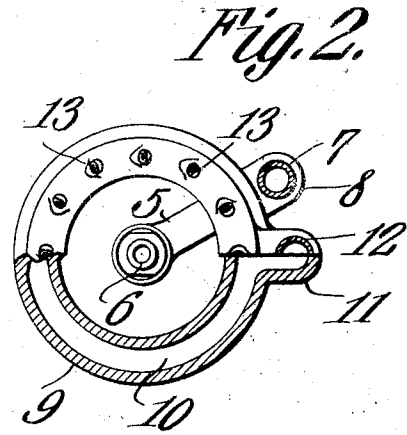
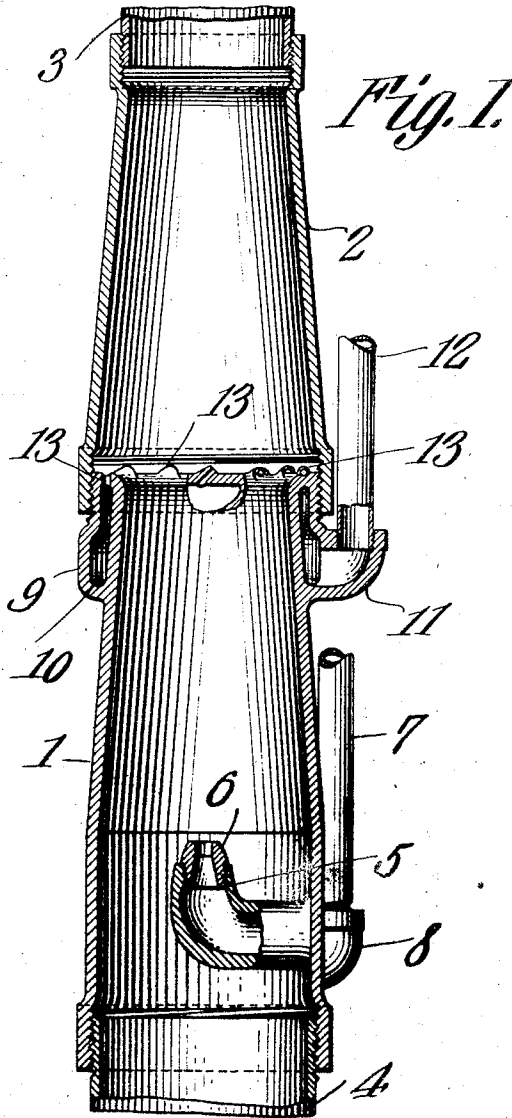


F. G. KIMBALL.
AIR LIFT PUMP.
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939,270.

Patented Nov. 9, 1909.



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UNITED STATES PATENT OFFICE.

FRANK GEORGE KIMBALL, OF WHITTIER, CALIFORNIA.

AIR LIFT-PUMP.

939,270.

Specification of Letters Patent.

Patented Nov. 9, 1909.

Application filed March 10, 1908. Serial No. 420,225.

To all whom it may concern:

Be it known that I, FRANK GEORGE KIMBALL, a citizen of the United States, residing at Whittier, in the county of Los Angeles and State of California, have invented a new and useful Air Lift-Pump, of which the following is a specification.

This invention relates to that class of mechanism known as air lift pumps; and has for its object to provide an improved air lift pump by means of which the air injected into the pump will be thoroughly mixed with the volume of liquid, and by means of which the lifting of the liquid volume will be made very effective.

The invention consists of an air lift pump constructed and arranged as hereinafter set forth and claimed.

Referring to the accompanying drawings Figure 1 is a view in elevation and vertical section of an air lift pump constructed in accordance with this invention. Fig. 2 is a plan view, partly in section, of the lower portion of the pump detached from the upper portion. Fig. 3 is a detail view of the lower jet nozzle.

The air lift pump, which may be made of brass, or other suitable metal, is constructed with the main frusto-conical section 1, the upper frusto-conical section 2, the discharge cylindrical portion 3, (only its lower end being shown and broken away), and the suction pipe 4, (only its upper end being shown), the several parts having their adjoining ends detachably connected by screw threads as shown.

Located in the lower end of the portion 1, and mounted on the inner wall thereof and projecting laterally therefrom, is an air jet, bent to project upwardly, and provided with a detachable nipple 6, screw-threaded thereon, the parts forming an injector nozzle. An air inlet pipe 8 is connected to the inlet passage way 8 communicating with the jet 5. As clearly shown in the drawings, the injector consists of a pipe which enters the pipe 1 and extends therein in a transverse direction, the end of said pipe being so bent that its end portion is in the line of the axis of the discharge pipe 2, whereby it forms the injector nozzle, and said injector pipe has a fiat form in cross section from its point of entrance to and including the bend in it, the longer dimension of such flattened form being parallel to the axis of the discharge pipe, by reason of which less resist-

ance is offered to the flow of the liquid through the pipe 1.

Air under pressure is forced through the pipe 7, and issues through the jet nozzle 6, thus tending to carry up a volume of liquid through the pipe 1, and this stream of liquid issues from the contracted mouth of said pipe, and passes into the larger end of the upper pipe 2.

The upper end of the pipe 1 is provided with a circumferential jacket or casing 9 inclosing an annular chamber 10 through which leads an inlet port 11, the latter being in communication with an inlet pipe 12 through which fluid under pressure is forced into the passage 10. This fluid escapes through a series of ports 13 which are arranged in a circular series, and presented in a direction to discharge tangentially to the circle thus described, and also tilted to discharge obliquely with respect to the axis of the pipe, by reason of which the fluid issuing from said ports is given a helical motion when it strikes the inner surface of the pipe. The jets of fluid issue from the ports 13 at the point where the stream of liquid issues from the pipe 1, and pass into the wider end of the pipe 2, so that at the point where the jets strike the outer surface of the stream of liquid, there is a free space which will permit the jets to issue freely from the ports. The helical jets strike against the liquid, and the fluid will tend to follow the wall of the pipe 2, thus forming a film between such wall and the stream of liquid, and at the same time will act to carry up or accelerate the movement of the stream to which an initial impulse has been imparted by the jet issuing from the nozzle 6.

The jets of fluid follow generally the interior wall of the pipe 2, and are not directed across the path of the liquid in such a manner as to interfere with, and retard the flow of the latter.

What is claimed is:

1. In an air lift pump, a pipe having above its inlet jet ports arranged in a circular series, and presented in a direction to discharge tangentially to the circle thus described, and also obliquely with respect to the axis of the pipe.

2. In an air lift pump, a pair of frusto-conical pipes disposed in alignment with each other, the smaller end of the lower pipe discharging into the larger end of the upper

pipe, an air injecting nozzle arranged centrally in the lower portion of the lower pipe, and an annular fluid chamber arranged at the top of said lower pipe, and provided with jet ports arranged in a circular series and presented in a direction to discharge tangentially to the circle thus described, and also to discharge obliquely with respect to the axis of the pipes.

3. In an air lift pump, the combination with the discharge pipe thereof, of an injector pipe entering said discharge pipe in a transverse direction, and so bent that its end portion is in the line of the axis of the

discharge pipe, whereby it forms an injector nozzle, said injector pipe having a flattened form in cross section from its point of entrance to and including the bend in it, the longer dimension of such flattened form being parallel to the axis of the discharge pipe.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

FRANK GEORGE KIMBALL.

Witnesses:

C. R. HOLTON,

MARSHALL L. HAZZARD.