J. S. PIPER.

AIR LIFT PUMP.

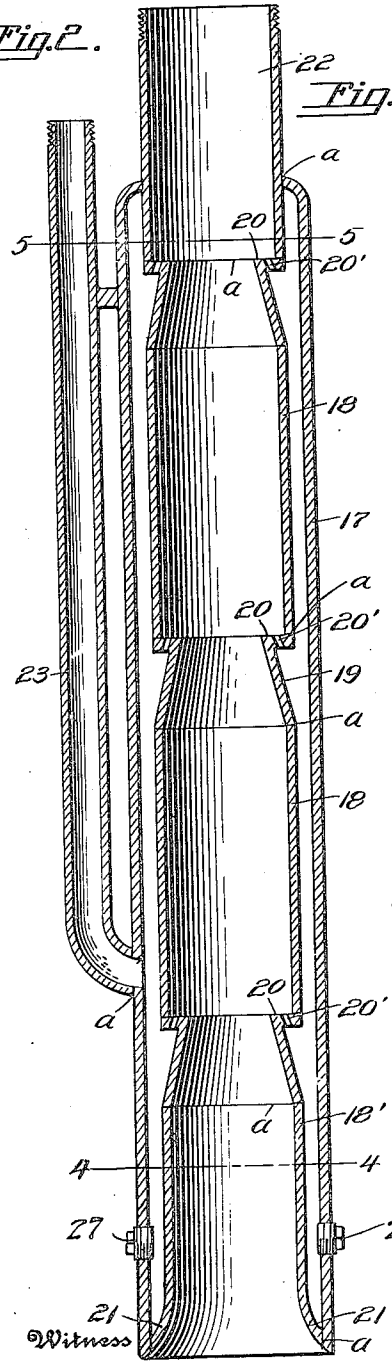
APPLICATION FILED OCT. 15, 1915. RENEWED DEC. 19, 1916.

1,232,393.

Patented July 3, 1917.

2 SHEETS—SHEET 1.

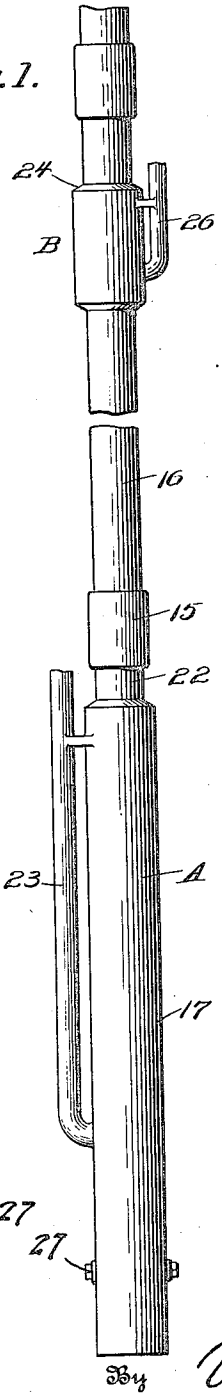
Fig. 2.



Witness

F. E. Gibson.

Fig. 1.



By Victor J. Evans

Attorney

Fig. 3.

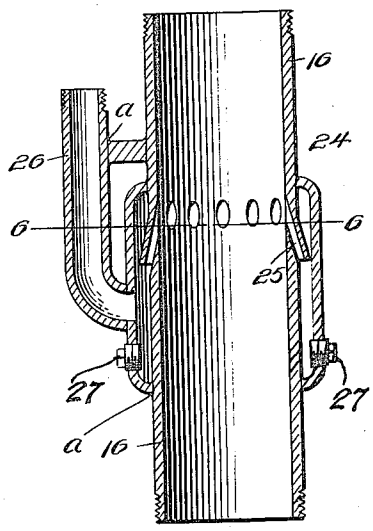
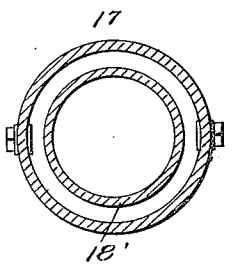


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 7.

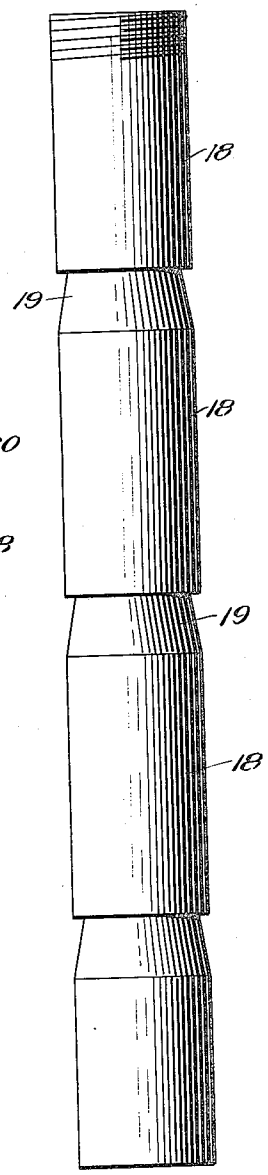


Fig. 5.

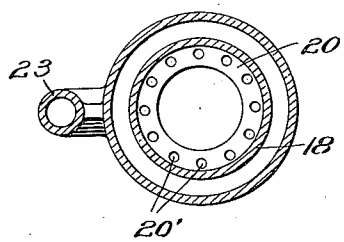
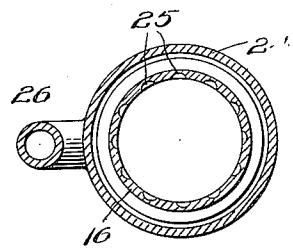


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOHN S. PIPER, OF LAWRENCEVILLE, ILLINOIS.

AIR LIFT-PUMP.

1,232,393. Specification of Letters Patent. Patented July 3, 1917.

Application filed October 15, 1915, Serial No. 56,067. Renewed December 19, 1916. Serial No. 137,912.

To all whom it may concern:

Be it known that I, JOHN S. PIPER, a citizen of the United States, residing at Lawrenceville, in the county of Lawrence and State of Illinois, have invented new and useful Improvements in Air Lift-Pumps, of which the following is a specification.

This invention relates to that class or type of devices for lifting liquids which are generally known as "air lift pumps" and in which air under pressure is injected to a conducting pipe, which latter is partly submerged in the liquid to be lifted, thereby inducing an upward current and flow of liquid in such pipe.

The invention has for its object to simplify and improve the construction and operation of the pump and the working parts thereof, thereby increasing the capacity of the pump and insuring a steady flow.

With these and other ends in view which will readily appear as the nature of the invention is better understood, the same consists in the improved construction and novel arrangement and combination of parts which will be hereinafter fully described and particularly pointed out in the claims.

In the accompanying drawings has been illustrated a simple and preferred form of the invention, it being, however, understood that no limitation is necessarily made to the precise structural details therein exhibited, but that changes alterations and modifications within the scope of the claims may be resorted to when desired.

In the drawings,—

Figure 1 is a view in side elevation of a pump constructed in accordance with the invention.

Fig. 2 is a vertical sectional view taken through the lower or main pump section.

Fig. 3 is a vertical sectional view taken through the upper or auxiliary pump section.

Fig. 4 is a sectional view taken on the line 4—4 in Fig. 2.

Fig. 5 is a sectional view taken on the line 5—5 in Fig. 2.

Fig. 6 is a sectional view taken on the line 6—6 in Fig. 3.

Fig. 7 is a detail side view of the injector associated with the lower or main pump section.

Corresponding parts in the several figures are denoted by like characters of reference.

The main pump section A which is connected by a coupling 15 with the lower end of the main conducting pipe 16 consists of a pipe or tubular jacket 17, the same surrounding an injector which is composed of a plurality of pipe sections 18, each having an upwardly tapering upper end portion 19 provided with a circumferential flange 20, said flange being threaded into or otherwise connected with the lower end of the pipe section next above. Each flange 20 is provided with an annular series of apertures 20′, said apertures being formed in substantially parallel relation to the tapered pipe portion 19 surrounded thereby, so that air and liquid forced upward through said apertures will assume the form of a conical jet, the same being forced upwardly with a force commensurate with the pressure under which the air is maintained. The lowermost pipe section which is specially designated by 18′ has at its lower end a bell-shaped mouth or intake 21 which is connected with the lower extremity of the jacket 17. Said jacket carries at its upper end a pipe section 22 which is of a diameter equal to that of the main conducting pipe 16 with which it is connected by the coupling 15.

An air inlet pipe 23 which, in practice, is connected at its upper end with a source of supply of compressed air communicates with the interior of the jacket 17 at a suitable distance from the lower end of the said jacket.

The upper pump section B comprises a jacket of cylindrical tubular shape which surrounds the conducting pipe 16 from which it is circumferentially spaced and with which it is connected at its upper and lower ends by means of flanges 24. That portion of the pipe 16 which is surrounded by the jacket B is provided with a circumferential series of upwardly tapering apertures 25. A supply pipe 26 for compressed air is connected with the jacket B.

The jackets of the lower and upper pump sections are provided near their lower ends with readily detachable plugs 27 for the purpose of enabling accumulations of mud, sand and other impurities to be readily removed.

It may be stated that in the manufacture of the improved pump the conical sections 19 with the flanges 20 are preferably made of steel, properly machined to the desired shape, these parts being obviously subjected to much greater wear than other parts of the device. The parts are assembled or joined

together at the places indicated by *a* and in other places where needed by welding by the use of an oxyacetylene flame or torch.

In the operation of this device the lower pump section is submerged in the liquid that is to be lifted, and air is supplied under pressure through the pipe or duct 23 to the jacketed space between the pipe 17 and the injector. The air being forced through the upwardly inclined apertures 20′ will induce an upward flow of liquid through said apertures and into the main conducting pipe. After rising to the height of the upper pump section, the liquid in the conducting pipe is subjected to the impulse of the air current entering through the pipe 26 and which, through the inclined apertures 25, will enter the conducting pipe, serving to give additional impetus to the column of liquid. In wells of great depth additional pump sections constructed like the upper pump section may be employed, and liquid may thus be raised from very deep wells by the use of air under comparatively low pressure, the upward flow being subjected to additional impetus at each station formed by such auxiliary pump sections.

Having thus described the invention, what is claimed as new, is:—

1. A pneumatic lifting device for liquids comprising a conducting pipe, a jacket at the foot of said conducting pipe spaced therefrom and connected therewith, an injector within said jacket comprising a plurality of pipe sections each having an upwardly tapered upper end portion provided with a lateral flange connected with the lower end of the superposed pipe section, said flange having apertures inclined upwardly in the direction of the axis of the pipe, the lowermost pipe section having a bell-shaped mouth connected with the jacket; and an air inlet connected with the jacket.

2. A pneumatic lifting device for liquids comprising a conducting pipe, a jacket at the foot of said conducting pipe spaced therefrom and connected therewith, an injector within said jacket comprising a plurality of pipe sections each having an upwardly tapered upper end portion provided with a lateral flange connected with the lower end of the superposed pipe section, said flange having apertures inclined upwardly in the direction of the axis of the pipe, the lowermost pipe section having a bell-shaped mouth connected with the jacket; and an air inlet connected with the jacket, said conducting pipe being provided at a distance above the inlet end with an auxiliary jacket connected with and spaced therefrom and with upwardly inclined apertures within said jacket, and said auxiliary jacket being provided with an air inlet.

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

JOHN S. PIPER.

Witnesses:
EUGENE SAPP,
I. B. DAUGHERTY.