O. M. PRUITT.

AIR LIFT PUMP.

APPLICATION FILED APR. 26, 1916.

1,214,952. Patented Feb. 6, 1917.

Fig. 1.

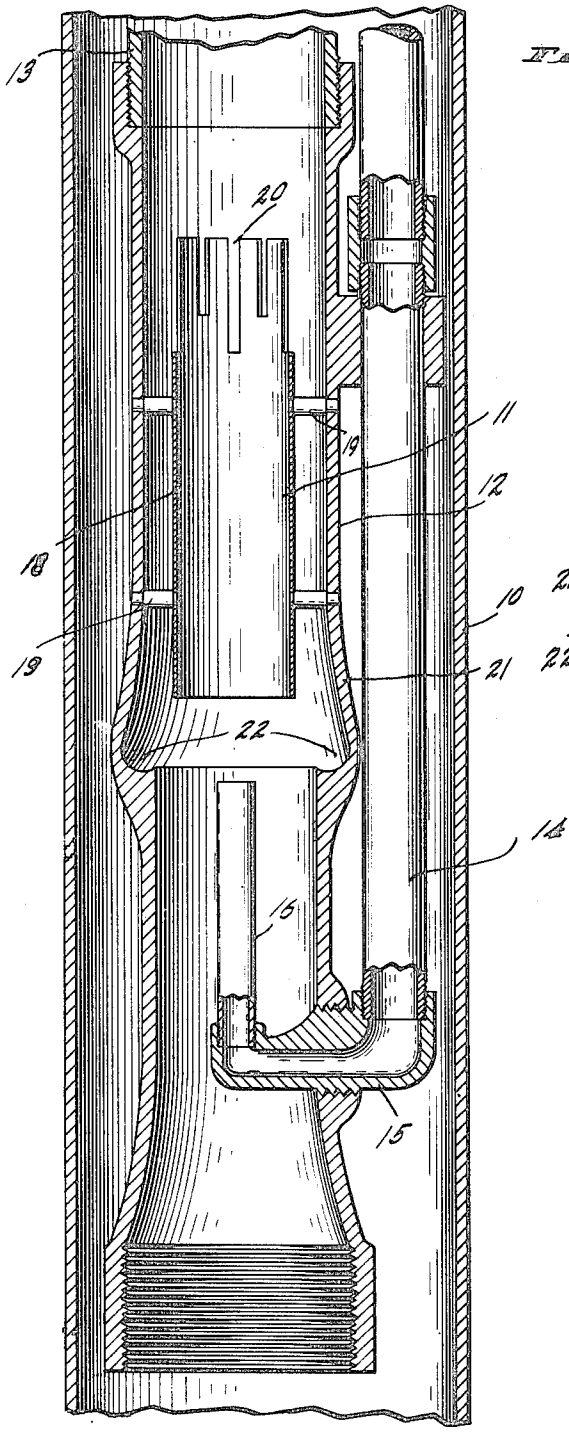
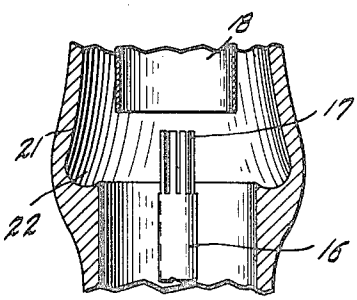


Fig. 2.



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AIR-LIFT PUMP.

1,214,952. Specification of Letters Patent. Patented Feb. 6, 1917.

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To all whom it may concern:

Be it known that I, ORAN M. PRUITT, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented a new and useful Air-Lift Pump, of which the following is a specification.

In the operation of airlift pumps, the water lags and tends to slide back along the outside of the water column or against the walls of the eduction pipe, and under some conditions actually slides back, and because of this sliding back the pump has heretofore usually ceased operation when the water level in the well outside the eduction pipe fell below a certain minimum.

It is the object of my present invention to lower the minimum of the water level outside the eduction pipe required for the operation of the pump.

In accomplishing this object, I turn the downwardly slipping envelop of water at the outside of the water column with the upward stream of air, so that it will be carried up thereby. To this end I provide the inner wall of the pump with a curved inwardly directed shoulder or deflecting surface which faces upward in the direction of eduction and throws the descending envelop of water at the outside of the column into the center of the column at about the level of the discharge of the air into the water, so that when this backward slipping of water occurs the water so slipping is thrown toward the center of the column directly into the stream of air and carried upward thereby.

The accompanying drawing illustrates my invention. Figure 1 is a vertical central sectional view through an airlift pump embodying my invention, with a fragment of the eduction pipe and well casing; and Fig. 2 is a fragmentary view of an airlift pump showing a modification of the air discharge nozzle.

Within the well casing 10 at the proper height is located the air lift pump 11, which has a tubular outer casing 12 discharging at its upper end into the eduction pipe 13 and open at its lower end to admit the water from within the well casing 10. Air is supplied through the air pipe 14, which extends down inside the well casing 10 from any suitable source of air supply and is connected through a fitting 15 to an air discharge nozzle 16 which discharges air upward within the casing of the airlift pump, and preferably along the axis thereof. The air nozzle 16 may be of any desired type; for instance, its upper end may be cut off square as shown in Fig. 1, or may be provided with longitudinal slots 17 as shown in Fig. 2. A mixing cylinder 18 is preferably provided, and may be supported by spacing pins 19 within the casing 12 of the airlift pump 11 in line with and above the nozzle 16, this mixing cylinder having both ends open and being spaced from the inner walls of the airlift pump so as to provide a cylindrical space within it and an annular space outside it. The upper end of the mixing cylinder 16 may be provided with any number of mixing slots 20, conveniently of varying depths, and the lower end of the mixing cylinder 18 is spaced above the upper end of the air nozzle 16.

The inner wall of the casing 12 as it descends is given an outward flare 21 some distance above the upper end of the air nozzle 16, which flare continues to about the level of the upper end of such air nozzle if the latter be cut off square or to about the level of the lower edges of the slots 17 if the discharge end of the air nozzle be provided with such slots; in any case preferably to about the lowest level of air discharge of the air nozzle. Then the flare 21 is turned inward in a smooth curve to form an annular shoulder 22, which faces upward in the direction of eduction and the inner edge of which is directed inward and preferably slightly upward. This shoulder 22 is below the lower end of the mixing cylinder 18, and is at about the point where the air nozzle 16 first mixes air with the water, or at about the top of the air nozzle when the nozzle is square as in Fig. 1 or the bottom of the slot 17 when such slots are provided; I now prefer to have such shoulder slightly higher than such point.

In operation, there is a decided lagging of an envelop of water along the inner wall of the eduction pipe 13 or at the outside of the rising column of water, and when the water level in the well casing 10 falls for any reason this lagging increases and may develop into an actual downward slipping along such eduction pipe. In consequence, when the water level within the casing 10 falls below a certain value the downward

slipping which develops has in former constructions interfered with or even stopped the pumping action. With the present construction, however, when this downwardly slipping envelop develops within the air pump, it is spread out along the flared portion 21 and is then deflected inwardly by the curved annular shoulder 22 into the path of the upwardly discharged air from the nozzle 16, so as to cause such downwardly slipping water to be carried back again up through the airlift pump 11 and into the eduction pipe 13. The mixing cylinder 18 and the slots 10 at its top serve to promote mixing of the air and water in normal operation; and the cylinder also serves to separate the downwardly slipping envelop from the rising central core of water and air, when such downwardly slipping envelop develops within the air pump. Because of the inwardly deflecting action of the curved annular shoulder 22, it becomes possible to continue the pumping operation when the water level within the casing 10 falls very low—to a point much lower than is possible when the shoulder 22 is not provided.

I claim as my invention:

1. An airlift pump, comprising a tubular outer casing, and an air nozzle within and discharging axially along such casing, the inner wall of such outer casing having a curved inwardly directed shoulder which faces in the direction of eduction and serves to deflect inward into the path of the air discharged from such nozzle any water sliding backward along the inner surface of said tubular casing.

2. An airlift pump, comprising a tubular outer casing, and an air nozzle discharging within such casing, the inner wall of such outer casing having a curved inwardly directed shoulder which faces in the direction of eduction and serves to deflect inward into the path of the air discharged from such nozzle any water sliding backward along the inner surface of said tubular casing.

3. An airlift pump, comprising a tubular outer casing, an air nozzle within and discharging axially along such casing, the inner wall of such outer casing having a curved inwardly directed shoulder which faces in the direction of eduction and serves to deflect inward into the path of the air discharged from such nozzle any water sliding backward along the inner surface of said tubular casing, and an open-ended mixing cylinder mounted within and spaced from the walls of said tubular outer casing on the discharge side of said air nozzle.

4. An airlift pump, comprising a tubular outer casing, an air nozzle discharging within such casing, the inner wall of such outer casing having a curved inwardly directed shoulder which faces in the direction of eduction and serves to deflect inward into the path of the air discharged from such nozzle any water sliding backward along the inner surface of said tubular casing, and an open-ended mixing cylinder mounted within and spaced from the walls of said tubular outer casing on the discharge side of said air nozzle.

5. An airlift pump, comprising a tubular outer casing, and an air nozzle within and discharging axially along such casing, the inner wall of said tubular casing flaring downward above the air nozzle and terminating at the lower end of such flare in an inwardly curved upwardly facing annular shoulder at about the point where the air nozzle discharges air into the water around it, so as to throw inward into the path of such air any water sliding backward along the inner surface of said tubular casing.

6. An airlift pump, comprising a tubular outer casing, and an air nozzle discharging within such casing, the inner wall of said tubular casing flaring downward above the air nozzle and terminating at the lower end of such flare in an inwardly curved upwardly facing annular shoulder at about the point where the air nozzle discharges air into the water around it, so as to throw inward into the path of such air any water sliding backward along the inner surface of said tubular casing.

In witness whereof, I have hereunto set my hand at Indianapolis, Indiana, this ninth day of February, A. D. one thousand nine hundred and sixteen.

ORAN M. PRUITT.