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FLUID LIFT DEVICE

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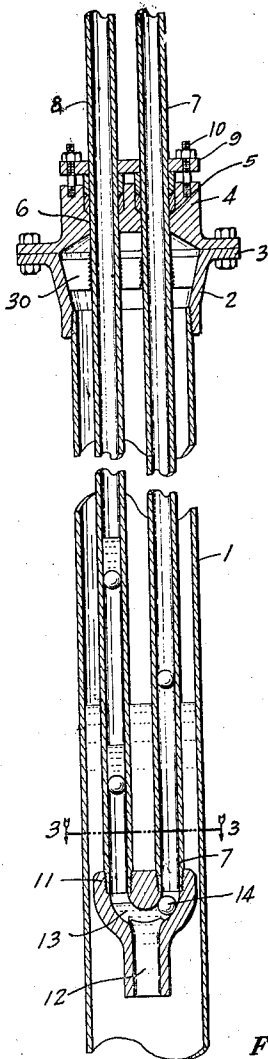


Fig. 1

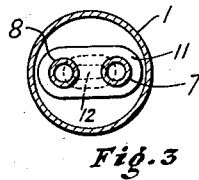


Fig. 3

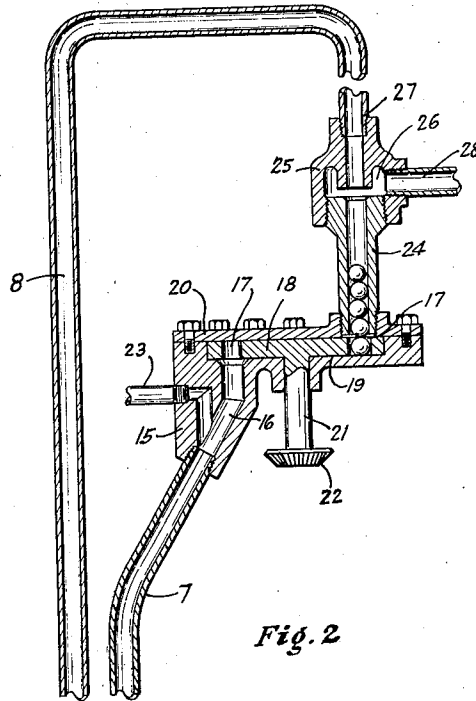


Fig. 2

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FLUID LIFT DEVICE

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5 Claims. (Cl. 103—1)

My invention relates to pneumatically operated pumps whereby liquid is raised from the well by devices operated through pneumatic pressure.

It is an object of the invention to provide a device for lifting liquid from deep wells wherein there are a plurality of separate barriers or plungers arranged for continuous operation in the well, each barrier carrying a separate load of liquid with it from the eduction tube.

I desire to provide a pump whereby the flow of liquid from the well may be made nearly continuous, the lifting operation being performed by means of pressure fluid forced into the well.

I further desire to provide means whereby the separate barriers or plungers may be delivered into a circuit at evenly spaced intervals of time and the liquid which is thereby raised from the well may be separated therefrom and delivered into the flow line.

The invention lies particularly in the arrangement of the apparatus whereby a continuous operation of the pump may be provided in such manner as to economize in the amount of pressure fluid employed.

In the drawing herewith Fig. 1 is a central longitudinal section through a well casing with my pumping device positioned therein.

Fig. 2 is a continuation of Fig. 1, illustrating the upper portion of the apparatus above the well casing, the same being in central vertical section.

Fig. 3 is a transverse section taken on the line 3—3 of Fig. 1.

In the drawing herewith I have shown my device somewhat diagrammatically. The casing 1 for the well is shown as being provided with a casing head 2 having a radial flange 3 thereon. There is a bonnet or cap 4 bolted to the flange 3, said bonnet acting to close the upper end of the casing except for two spaced openings 5 and 6 therein. These openings allow the passage therethrough of the inlet pipe 7 and the outlet pipe or eduction tube 8. Stuffing boxes are formed in the bonnet 4 about the pipes 7 and 8 to seal against the passage of fluid therethrough, said stuffing boxes having a gland 9 thereon tightened into position by bolts 10.

The pipes 7 and 8 are supported in the casing head 2 by slips 30 setting within the tapered portion of the head and having toothed surfaces engaging said pipes.

The fluid is conducted from the well through the eduction tube 8 which extends downwardly into the well to a point below the level of the liquid therein and is there connected to a bush-

ing 11. Said bushing has a lower inlet passage 12 leading upwardly to a curved chamber 13 connecting the eduction tube with the inlet pipe 7 which is also screwed within an opening of the upper portion of the bushing 11. The chamber 60 or passage 13 which connects the lower ends of the tubes 7 and 8 is of uniform diameter so that the spherical shaped plungers 14 may move from one tube to the other through said chamber in an obvious manner. The upper end of the inlet 65 opening 12 to the bushing is of less width than the diameter of the balls 14 as seen in Fig. 3, so that they may not drop out through the opening 12.

The balls, together with the pressure fluid are 70 delivered into the tube 7 by the apparatus disclosed in Fig. 2. The upper end of the pipe 7 is curved laterally and connected within a head 15. Said head has a passage 16 leading toward the upper end of the head and adapted to register with openings 17 in a rotating disc 18. Said disc 18 fits closely within a chamber 19 formed in the lower wall of the head 15 and between the same and an upper cap plate 20. The disc 18 has an operating shaft 21 thereon which projects 80 downwardly through the head and is adapted to be connected with some source of power by means such as the beveled gear 22.

The air or gas is delivered to the passage 16 and the pipe 7 through pipe 23 which is connected with a passage in the head 15, said passage 23 being directed downwardly into the said passage 16 through which the balls are delivered.

The balls are received into the openings 17 in the disc 18 from a small magazine or nipple 24 90 extending upwardly from the cap plate 20. The said magazine is connected at its upper end with a coupling member 25 having an inner chamber 26. The upper end of the coupling is connected at 27 with the eduction tube 8 which is curved laterally 95 and connected with said coupling in any desired manner. There is a lateral flow line 28 also connected with the chamber 26 through which the fluid may find an outlet to storage or other receptacle not shown.

In the operation of my device the balls are 100 delivered at predetermined intervals through the passage 16 and the pipe 7 into the well. Air or gas is constantly delivered into the pipe 7 and it will be seen that as each ball rounds the lower 105 end of the tube 7 it will engage a load of liquid ahead of it and carry it around into the eduction tube 8. It is contemplated that the load in each case will be small enough so that it can be elevated by the force of the fluid pres- 110

sure behind it upwardly to the surface and discharged into the coupling member 25 where it will flow outwardly into the flow line 28. The ball behind each charge of liquid will pass downwardly into the magazine 24 and will be engaged eventually in an opening 17 in the disc and carried around and delivered again into the inlet tube 28. It will be seen that the balls may be spaced from each other at any predetermined distance by the rate of rotation of the disc 18 which may be easily regulated. Also, the pressure upon the gaseous fluid entering through the pipe 23 may be regulated so that charges of liquid will be carried upwardly from the well in regularly spaced intervals, so that the flow from the well may be fairly continuous. This device may be easily and economically operated and will function for long periods of time without the necessity of attention or repair.

20 What I claim as new is:

1. A pump including an inlet tube and an eduction tube, a bushing connecting the lower ends of said tubes, a fluid inlet from the well to said bushing, means to deliver a series of balls to the upper end of said inlet tube, means to conduct gaseous pressure fluid to said inlet tube behind each of said balls, and an outlet flow line from said eduction tube.

2. A pump including an inlet tube, an eduction tube, a bushing connecting the lower ends of said tubes, said bushing having a fluid inlet thereto, a series of balls in said tubes, means to collect and feed said balls in evenly spaced relation to said inlet tube, means to conduct pressure fluid into said inlet tube behind said balls, and

an outlet from said eduction tube for the fluid being pumped.

3. A pump including an inlet tube, an eduction tube, a bushing connecting the lower ends of said tubes, said bushing having a fluid inlet thereto, a series of balls in said tubes, means to collect and feed said balls in evenly spaced relation to said inlet tube, means to conduct pressure fluid into said inlet tube behind said balls, and a separating chamber at the upper end of said eduction tube arranged to pass said balls to said collecting means and conduct said fluid from said tube.

4. In a fluid lift device, an inlet tube and an eduction tube connected at their lower ends and having a liquid inlet at said lower ends, a closed chamber at the upper end of said inlet tube, a disc rotatable therein, said disc having a series of ball-receiving openings therein adapted to register in succession with said inlet tube, means to deliver balls to said openings, means to deliver pressure fluid to said inlet tube behind said balls, and a fluid outlet from said eduction tube.

5. In a fluid lift device, an inlet tube and an eduction tube connected at their lower ends and having a liquid inlet at said lower ends, a closed chamber at the upper end of said inlet tube, a disc rotatable therein, said disc having a series of ball-receiving openings therein adapted to register in succession with said inlet tube, means to deliver balls to said openings, means to deliver pressure fluid to said inlet tube behind said balls, an outlet from said eduction tube, and a chamber adjacent thereto to receive said balls and pass them on past said outlet to said ball delivering means.

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