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PUMP.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ACHILLE BERTELLI, a subject of the King of Italy, and resident of Brescia, Italy, have invented certain new and useful Improvements in and Connected with Pumps, of which the following is a specification.

This invention refers to pumps for liquids and comprises means for injecting air or a gaseous fluid into the column of liquid for the purpose of raising the said liquids to heights superior to that which would be possible only with atmospheric pressure.

The principle on which the present invention is based consists in the simultaneous action of a suction or a suction and force pump producing a normal column of liquid, corresponding to the atmospheric pressure in the suction pipe, and of any suitable means (driven conjointly or separately) for forcing in air for the purpose of introducing compressed air to the interior and at the bottom of the column of water or liquid referred to above and thereby producing a number of air bubbles in the column of liquid. The air bubbles following after each other act as complete or partial diaphragms, and owing to their lighter specific gravity and their progressive expansion, entrain during their ascent the liquid between them. This lightness of the air compressed under and into a column of liquid already drawn up by the suction pump and its progressive expansion, are the essential reasons for the raising of the liquid beyond the level attainable with an ordinary suction pump. This fact constitutes the essential characteristics of the pump forming the subject matter of the present invention applicable for special purposes and more particularly in combination with non-rising Artesian or tubular wells.

This new pump permits of extracting water from the deepest tubular wells of large as well as small diameter without necessitating the use of any complicated and expensive machines.

In the accompanying drawings, Figure 1 is a vertical section of my improved pump. Fig. 2 is a similar view of a different form of the invention. Fig. 3 is a similar view of a further modification of the invention.

Referring to the drawings Fig. 1, 1 is a sealed tube, the lower end of which is formed with perforations through which water flows. The top of the tube 1 is sealed by a

cap 2, through which passes a pipe 3, which extends into the tube 1. The pipe is contracted some distance below the cap 2 to form a valve seat 3, on which operates a ball valve 4. A small tapered air-injecting tube 6 open at both ends is arranged near the lower end of the pipe 3, and is supported by a short tubular extension 5 which communicates with the air injecting tube 6, and a space formed between the tube 1, and pipe 3. The pipe 3 is open at its lower end and is connected at its upper end to a single, double or multiple acting suction or suction and force pump 7 of any suitable construction. The pump 7 also operates an air pump 8, which is connected to an air chamber 9, having an automatic regulating valve 10, a tube 11 communicates with the air chamber 9 and the space 9^a formed between the tube 1 and the pipe 3.

Referring to Fig. 2, a pipe 13 which corresponds to the pipe 3 of Fig. 1, dips into a well 14. Compressed air is injected into the interior of the pipe 13 by means of an air injecting pipe 15, connected to an air pump by means of tube 16, while the top of the pipe 13 is connected up to the suction pump 7 as previously described.

In view of the air arrangement shown in Fig. 2, a pipe 18 may be used as shown in Fig. 2^a. In this instance a pipe extends in the well and is bent upwardly and projects into the pipe 17, or a pipe 17 may be provided with an enlarged lower end and mounted therein is a tube 23^a open at both ends. Fitting in this tube 23^a is an air inlet pipe 23^b as shown in Fig. 2^b.

In the form of the invention illustrated in Fig. 3, 19 indicates the well tube, formed at its lower end with perforations through which water may pass. The upper end of this tube is provided with a cap, which has a pipe 20, communicating therewith. Extending through the cap and into the tube 19 is a pipe 21, spaced from the walls of the latter to form a passage for the exit of water. The lower end of pipe 21 is reduced to form a nozzle and is perforated, and fits in a tube 22, centrally supported in the tube 19. The upper end of the pipe 21 is connected to an air compressor, so that air forced through the pipe 21 will pass upwardly in the tube 22 to the tube 19 and lift the water therein and force same through the pipe 20.

In operation, the suction pump is oper-

ated, which also operates the air pump and forces air into the chamber 9. The fuel from chamber 9 is forced into the space 9^a and is ejected into the rising column of water in the outlet pipe. With the force of the suction combined with the lifting of the water by the compressed air, I am enabled to raise water to a much greater height than with pumps with which I am familiar.

10 I claim—

1. In a pump of the class described, the combination of a well tube, a pipe fitting in the well tube and communicating with the latter, means for sealing the upper end of the well tube, a suction pump connected with the pipe, an upwardly tapered air injecting tube centrally disposed in the pipe, and means for forcing a continuous supply of air through the tapered air injecting tube.

20 2. In a pump of the class described, the combination of a well tube formed at its bottom with openings for the admission of water, a seal at the upper end of the well tube, a pipe extending in the well tube and communicating with the water in the bottom of the latter, said pipe being spaced from the well tube, an upwardly tapered air injecting tube centrally disposed near the bottom of the pipe, a pipe connecting the upwardly extended air injecting tube and the space formed between the well tube and the pipe, a suction pump communicating with the upper end of the pipe, and an air pump for supplying air to the space between the pipe

and the well casing to supply air to the air injecting tube. 35

3. In a pump of the class described, the combination of a well tube formed at its bottom with openings for the admission of water, a seal at the upper end of the well tube, a pipe extending in the well tube and communicating with the water in the bottom of the latter, said pipe having a restricted portion, to form a valve seat, a valve cooperating with the valve seat, said pipe being spaced from the well tube, an upwardly tapered air injecting tube centrally disposed near the bottom of the pipe and below the valve, a pipe connecting the air injecting tube and the space formed between the pipe and the well tube, an air pump for supplying said space with air, and a regulating valve on said air pump. 40 45 50

4. In a pump of the class described, the combination of a well tube, formed at its bottom with openings, a pipe extending into the well tube and communicating with the water therein, an air injecting tube cooperating with the pipe to lift water therein, a suction pump communicating with the pipe, and an air pump to supply air to the air injecting tube. 55 60

In testimony whereof I have hereunto set my hand in presence of two witnesses.

ACHILLE BERTELLI.

Witnesses:

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LYLE ROBB.