(No Model.)

J. E. BACON.

PNEUMATIC WATER ELEVATOR.

No. 542,620. Patented July 16, 1895.

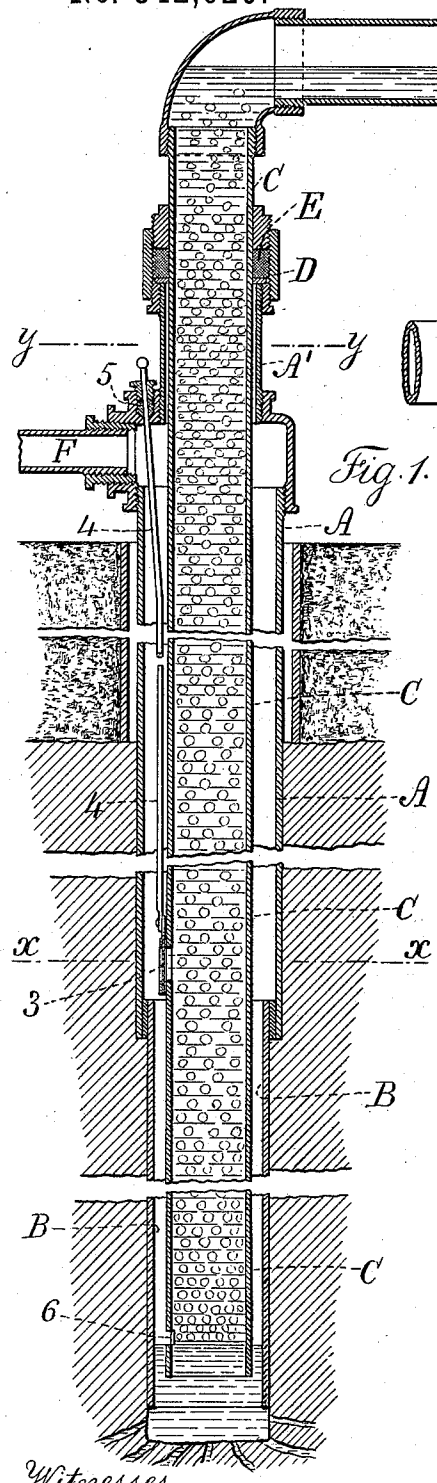

Fig. 1.

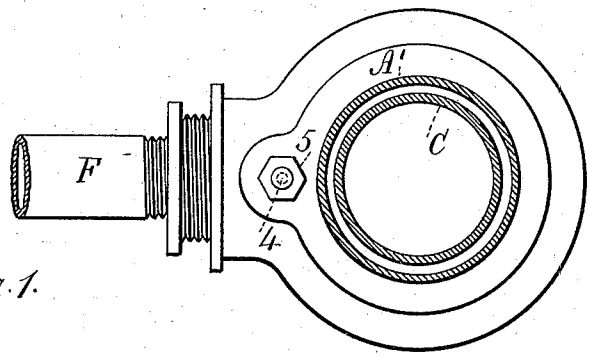

Fig. 3.

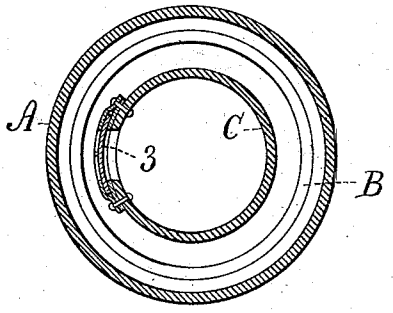

Fig. 2.

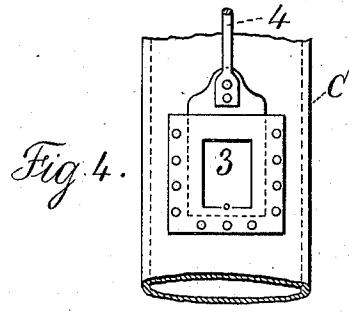

Fig. 4.

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UNITED STATES PATENT OFFICE.

JAMES EDWARD BACON, OF RICHMOND, VIRGINIA.

PNEUMATIC WATER-ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 542,620, dated July 16, 1895.

Application filed May 10, 1894. Serial No. 510,696. (No model.)

To all whom it may concern:

Be it known that I, JAMES EDWARD BACON, a citizen of the United States, residing at Richmond, in the county of Henrico and State of Virginia, have invented an Improvement in Pneumatic Water-Elevators, of which the following is a specification.

Water and other liquids have heretofore been elevated by the action of a jet of air directed upwardly at the bottom of a pipe, and in other instances the air has been admitted through the side of an uptake-pipe, and the bubbles of air in displacing the water have lessened the weight of a column of water of a given height, so that the pressure of water at the bottom of the uptake-pipe has been sufficient to elevate the column of water to the desired place. In apparatus of this character it has been important to provide an air-reservoir between the pump and the uptake-pipe, so as to equalize the action of the pump and prevent the pulsations thereof from varying the pressure of the air at the bottom of the uptake-pipe or well, and in addition to this difficulty has been experienced in obtaining a large uptake-pipe for a given size of drilled well, because the air-pipe has passed down at the side of the uptake-pipe and the combined measurements of these two pipes have necessarily been less than the diameter of the well.

In most drilled wells, either for water or oil, the upper portion of the well is considerably larger in diameter than the lower portion, and in many instances it is necessary to pipe the well where it passes through the earth and also where it passes through the upper stratum of rock.

By my improvements I make use of the casing of the well to form an air-chamber, and I continue such casing down to the proper depth, so that the air passes down around the uptake-pipe and enters the uptake-pipe either through an opening near the bottom end thereof or by passing around the lower end of such uptake-pipe.

By this improvement the upper end of the tubing or casing of the well is closed around the upper part of the uptake-pipe and the air is admitted into this casing from the air-compressor and the use of a separate air-reservoir is avoided, and in addition to this the uptake-pipe can be much larger than heretofore, because it is only necessary to provide a space between the uptake-pipe and the well-casing sufficient for the descent of the air, and the uptake-pipe is not in any manner connected to or influenced by the well-casing, through which the air is supplied. Hence the said uptake-pipe can be removed for cleaning or repairs without disturbing the portion of the apparatus that supplies the air.

In the drawings, Figure 1 is a vertical section illustrative of the present improvement. Fig. 2 is a horizontal section at the line $x\,x$ illustrating the relative sizes of the casing and uptake-pipe. Fig. 3 is a section at the line $y\,y$, and Fig. 4 is an elevation of the slide-valve. Figs. 2, 3, and 4 are on a larger scale than Fig. 1.

The well is to be of any desired character, such, for instance, as a drilled oil-well or Artesian well, and the same is made in any convenient way, according to the location and materials through which the well is driven.

The casing A is as large as convenient for the upper part of the well, and to this is connected the tube B descending into the smaller part of the well to the desired depth, and these tubes may be made permanent in the well, and the uptake-pipe C is of the desired size, according to the volume of liquid to be delivered, it only being necessary to maintain a sufficient space between the uptake-pipe and the pipe B for the passage of the requisite quantity of air, and the uptake-pipe C passes to the place where the liquid is to be delivered.

I provide the upper end of the pipe A′ with a ring D, containing a packing-gland E, which surrounds the up take-pipe C, so as to make a tight joint and allow for expansion or contraction if necessary, and the air-pipe F from a suitable compressor connects with the upper part of the pipe A, so that the air under the proper pressure is forced into the pipe A, and the reservoir for air is formed between the case A B of the well and the uptake-pipe C, and the air-space thus produced is almost always ample to prevent irregularity in the air passing into the lower end of the uptake-pipe C.

I find it advantageous to make an opening 6 into the uptake-pipe C near the bottom end

thereof, so that the air may flow through that opening in a uniform or nearly uniform stream, and the bubbles of air intermingling with the water render the column of water sufficiently light for the pressure of the column of water within the well to discharge the water or liquid at the desired height from the upper end of the uptake-pipe C.

It will be understood that the liquid flows into the well under the pressure of the liquid, whether the liquid rises within the tubing or casing of the well or not, and hence the pressure of the liquid is as effective in sustaining the column of aerated liquid as it would be if the liquid rose within the casing of the well, and for this reason I am enabled to make use of the casing of the well as an air-reservoir and simplify the construction of the apparatus, lessen the expense, and employ a much larger uptake-pipe than would be possible in cases where the air passed down the well in a pipe at the side of the uptake-pipe.

The air passing in at the lower part of the uptake-pipe is usually sufficient in volume to lighten the column; but with deep wells or with considerable lift for the water above the water-level in the well it is sometimes advantageous to employ an auxiliary lift by providing a second air-supply higher up in the uptake-pipe to still further lessen the weight of the column of liquid. To effect this object the slide-valve 3 may be provided over an opening in the uptake-pipe at any desired level, and a rod 4 extending from this valve up through a stuffing-box 5 allows the said valve to be opened by hand more or less and thus to admit the volume of air required for operating the auxiliary lift to the best advantage.

If the level of the water is not lowered by the pumping, the pressure of air has ultimately to be sufficient to displace the column of water to the bottom of the uptake-pipe, but where the level of water in the well is materially lowered by the discharge of the water from the well I find that the use of a pressure sufficient to displace the normal column of water before commencing the discharge of the water is avoided by opening the valve 3 and reducing the level by the discharge of the water, and then, the external column being lowered, the same pressure will displace the column in the air-pipe until the air reaches another valve at a lower level or reaches the lower end of the pipe, so that the discharge of the water will be effected at a less pressure than would be possible if the valve 3 was not provided.

I am aware that in Patent No. 47,793, granted May 23, 1865, to A. Brear, an ejecting-pump is set forth in which there is an uptake-pipe within a descending air-pipe through which the air or gaseous fluid is delivered into the lower end of the uptake-pipe to aerate the water, and I am also aware that in Patent No. 309,214, granted December 16, 1884, to S. Fertig, the air under pressure is forced into the well and issues through lateral and upwardly-directed openings for drawing the liquid from the lower part of the well, there being a packing at the lower part of the compressed-air chamber between the rock through which the well is bored and the uptake-tube, and in some instances the pressure in a gas-well has been made use of for drawing up the water or other liquid from the bottom of the well, as in Patent No. 371,006, granted October 4, 1887, to J. J. Waits.

In my present improvement the drilled well is tubed down below the lower end of the uptake-pipe, so that the atmospheric pressure in such tube does not tend to force back the liquid flowing into the well, and by this means the entire size of the well is availed of, so as to obtain the full capacity of the well through a much smaller bore than has heretofore been employed in such water-raising device as that shown in Patent No. 47,793, and by making use of valves directly upon the uptake-pipe, with rods extending to the top of the well, I am able to regulate such valves and they do not interfere with the descent of the compressed air nor lessen the size of the uptake-pipe, and by this improvement I am enabled to place in the drilled well itself all the devices that are necessary for regulating the action of the air upon the water and for obtaining a maximum discharge by or under as low a pressure as consistent with the extent of the elevation of the water.

I claim as my invention—

1. The combination in a water elevating apparatus, of an up-take pipe a surrounding tube extending to the lower end of the up-take pipe, or nearly so, an air tight connection between the up-take pipe and its surrounding tube, and a pipe for supplying air or other fluid under pressure, an opening in the uptake pipe above the lower end thereof, a valve for opening or closing that opening, and a rod extending to the top of the well for operating the valve, substantially as and for the purposes set forth.

2. The combination in a water elevating apparatus with a drilled well, of an uptake pipe, a tube within the well surrounding the uptake pipe and extending below the lower end of the same, and an air tight connection between the upper end of the exterior tube and the uptake pipe for forming an air chamber around the uptake pipe, and a pipe for supplying air or other fluid under pressure into the air chamber whereby the air chamber and the uptake pipe are of as great capacity as the drilled well is adapted to receive, there being two or more openings in the uptake pipe at different elevations, and a valve and means for opening or closing the same from the top of the well for regulating the inlet of air to the up-take pipe, substantially as set forth.

3. The method herein specified of discharging liquid from a well consisting in providing an uptake pipe extending above the top of

the well and having two or more air inlets at different levels, and an air tight space within which air under pressure can act upon the water standing at the ordinary level in such space and force the same down until the air escapes into one of the openings in the uptake pipe and continuing the air pressure and discharge of water until the level of water in the confined chamber descends in consequence of the level of the water in the well descending until the air escapes through the second opening in the uptake pipe, substantially as set forth.

Signed by me this 1st day of May, 1894.

JAMES EDWARD BACON.

Witnesses:

E. S. BLANTON,

WILL F. STEWART.