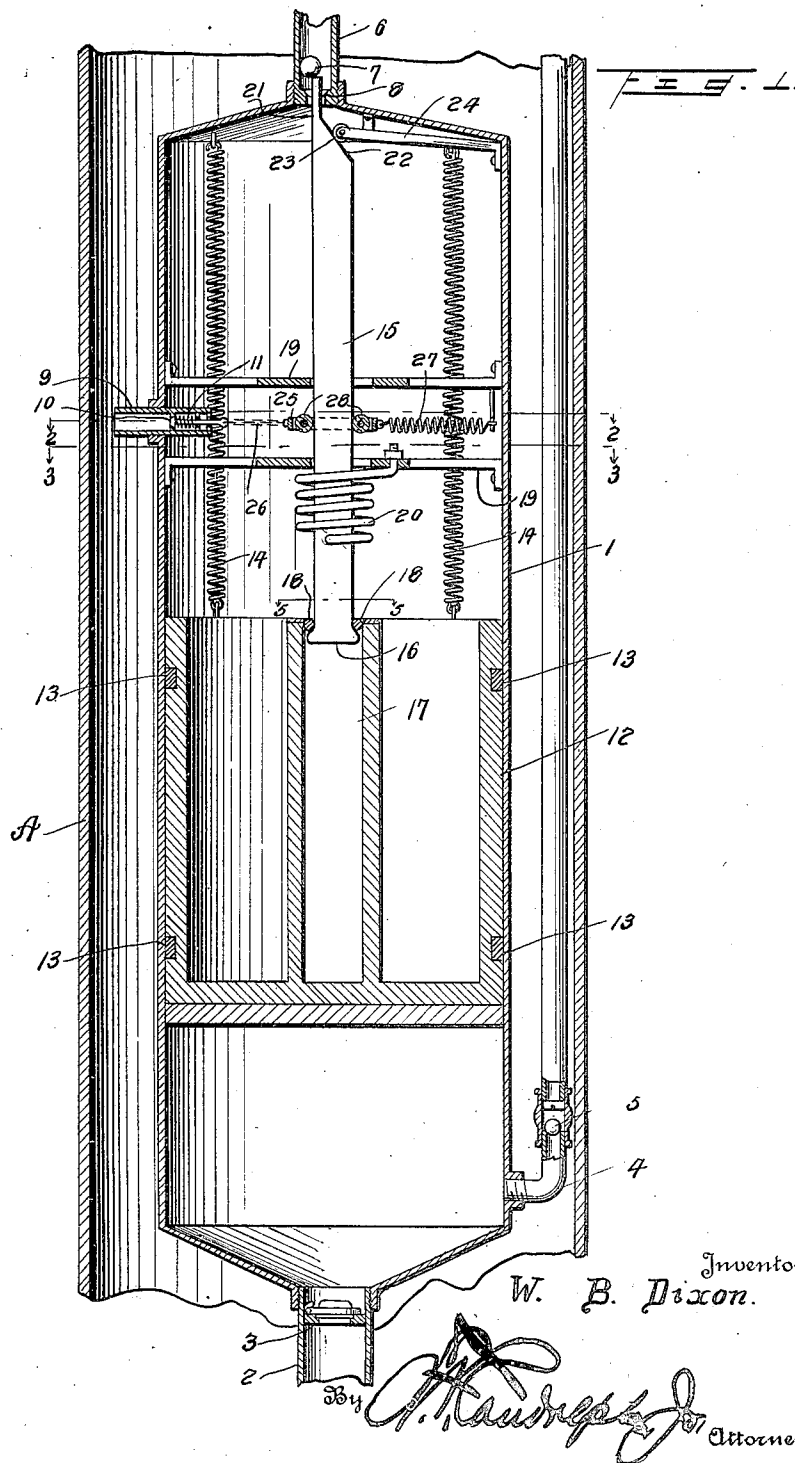


Feb. 13, 1923.

W. B. DIXON.
COMPRESSED AIR LIQUID ELEVATOR.
FILED MAR. 23, 1921.

1,445,497.

2 SHEETS—SHEET 1.—

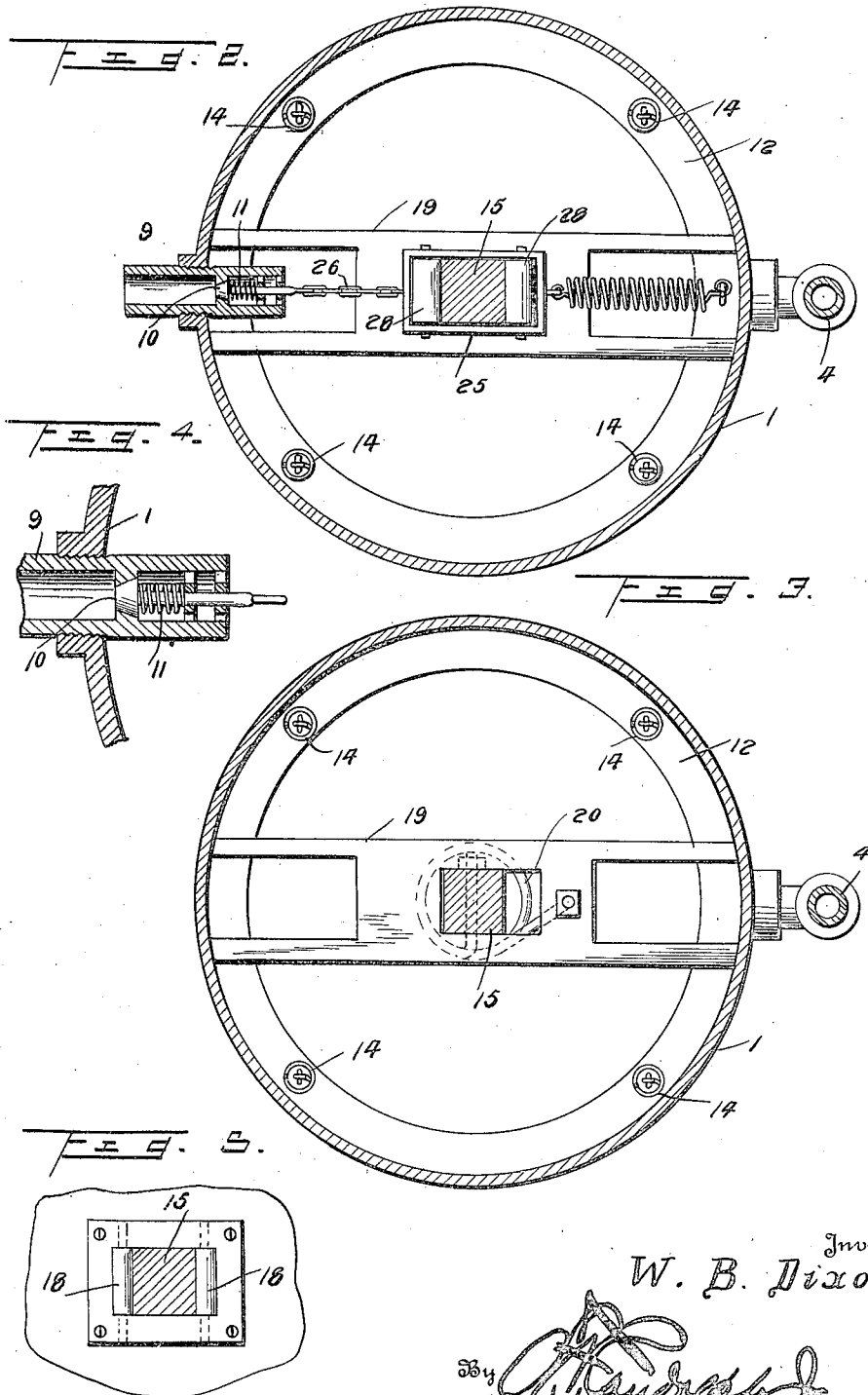


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2 SHEETS—SHEET 2.



Inventor
W. B. Dixon

By *[Signature]* Attorney

UNITED STATES PATENT OFFICE.

WALTER B. DIXON, OF SPRAY, NORTH CAROLINA, ASSIGNOR OF ONE-THIRD TO VANN L. MARSH AND ONE-THIRD TO GEORGE W. CHATHAM, BOTH OF SPRAY, NORTH CAROLINA.

COMPRESSED-AIR LIQUID ELEVATOR.

Application filed March 23, 1921. Serial No. 454,890.

To all whom it may concern:

Be it known that I, WALTER B. DIXON, a citizen of the United States, residing at Spray, in the county of Rockingham and State of North Carolina, have invented certain new and useful Improvements in Compressed-Air Liquid Elevators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention has relation to the lifting of liquids from deep wells and has for its principal object the provision of means by which compressed air is utilized for moving a pumping piston downwardly and springs to raise the piston when the pressure of the air is relieved, the admission of air to the pump cylinder and its discharge therefrom being automatically controlled by the movement of the piston.

A further object of the invention is the provision of a pump cylinder adapted to be inserted in the well and having its lower end communicating with the liquid in the well by means of a valved pipe, and a valved discharge pipe also connected with the lower end of the cylinder and extending to above the top of the well. The upper end of the cylinder is connected to a source of supply of air under pressure by means of a pipe provided with a valve to control the entrance of air to the cylinder. The upper end of the cylinder is also provided with a valved discharge for releasing the pressure from the cylinder. Mounted in the cylinder is a pump piston having springs connecting it with the top of the cylinder to normally raise it, said piston being actuated downwardly by air pressure admitted through the air pipe aforesaid. A plunger is also provided and actuated by the piston to close the valve in the air supply pipe and open the valve in the discharge when the piston is moved downwardly to release the pressure above the piston and permit the springs to raise it for another stroke.

The details of the invention will be described hereinafter and illustrated in the accompanying drawings in which:—

Fig. 1 is a central vertical sectional view of a fragment of a well casing showing my improved liquid elevator positioned therein,

Fig. 2, a cross section on a plane indicated by the line 2—2 of Fig. 1 looking in the direction of the arrows,

Fig. 3, a similar view on the line 3—3 of Fig. 1 looking in the direction of the arrow,

Fig. 4, a longitudinal sectional view on an enlarged scale of the air discharge pipe.

Fig. 5 is a view on line 5—5 of Fig. 1.

Referring to the drawings in which similar reference characters designate corresponding parts in the several views, A indicates a well casing of the usual construction. 1 designates a pump cylinder in casing A having its lower end connected by means of a pipe 2 with the liquid in the well and provided with a valve 3 of any suitable type and arranged to permit the liquid to enter the cylinder but to not discharge therefrom. 4 designates a pipe also connected with the lower end of the cylinder and leading to the top of the well and provided with a suitable valve 5 arranged to prevent return of the liquid in the pipe to the cylinder.

The upper end of the cylinder is connected with a source of supply of air under pressure by means of pipe 6 having a valve, preferably of the ball type, designated 7, and a valve seat 8. 9 indicates a discharge pipe in the upper end of cylinder 1 and provided with a valve 10 that is normally closed by a spring 11.

12 designates the pump piston reciprocally mounted in cylinder 1 and provided with the usual packing rings 13 of any preferred type, said piston being preferably made of sheet metal. 14 indicates springs connecting the upper end of piston 12 with the upper end of cylinder 1, said springs having sufficient retractile strength to overcome the weight of and raise piston 12 and the column of liquid in the cylinder and supply pipe 2. 15 designates a plunger, preferably rec-

tangular in cross section and having an enlarged head 16 that is slidably mounted in a central rectangular recess 17 formed in piston 12, 18 indicating anti-friction rollers journaled in the upper end of recess 17 and adapted to engage the sides of plunger 15 above the head 16 and also act as a stop to engage head 16 and lower the plunger when the piston nears the completion of its downward stroke. Plunger 15 is guided in its movements by elongated rectangular bearings 18 secured to the walls of cylinder 1 by bars 19 formed integral with said bearings, said bearings being arranged one above and the other below the plane of discharge pipe 9. 20 indicates a spring connecting plunger 15 and the lowermost bearing 18 and adapted to normally lift said plunger.

The upper end of plunger 15 is formed with a reduced portion 21 that is adapted to engage ball valve 7 and lift it from its seat when plunger 15 is in its uppermost position. Immediately below reduced portion 21 is an inclined shoulder 22 that is engaged by a roller 23 journaled in the end of arm 24 secured to the wall of cylinder 1.

25 designates a yoke surrounding plunger 15 and connected at one side to the stem of valve 10 by means of a chain or other flexible member 26, while the other side of the yoke is connected to the opposite wall of the cylinder 1 by means of retractile coil spring 27. 28 indicates rollers mounted on the sides of yoke 25 and forming an anti-friction bearing for plunger 15.

In operation, assuming that the piston 12 is in its uppermost position, valve 7 is in open position and valve 10 closed, air under pressure will enter cylinder 1 and will force piston 12 downwardly. When rollers 18 engage head 16 of plunger 15, said plunger will be also actuated downwardly permitting valve 7 to close and spring 27 will retract and pull said plunger in the direction of the spring and open valve 10 to permit of escape of air from the cylinder. When the air pressure in the cylinder is reduced sufficiently springs 14 will retract raise piston 12 to its initial position, spring 20 at the same time raising plunger 15. When plunger 15 is moved upwardly roller 23 on arm 24 by engaging inclined shoulder 22 will move said plunger to the side against the resistance of spring 27 thus permitting spring 11 to reseal valve 10 and stop the discharge of air from the cylinder and the continued upward movement of the plunger will cause reduced portion 21 to engage valve 7 and unseat it to permit resumption of admission of air for the next stroke of the piston. It will be further understood that on the downward stroke of the piston the liquid in the lower end of cylinder 1 will be discharged through pipe 4, valve

3 being closed, while on the up stroke of the piston liquid will enter the cylinder to fill the vacuum caused by movement of the piston, valve 5 in pipe 4 being closed.

It will also be understood that changes in construction may be made within the scope of the invention without altering the spirit thereof, and I do not, therefore, limit myself to the specific construction as shown and described except as specifically set forth in the claims appended hereto.

Having thus described the invention what I claim is:—

1. In a compressed air liquid elevator, a pump cylinder, a piston in said cylinder, means to urge raising movement of said piston, valve control means to admit air under pressure to said cylinder to lower the piston including a plunger, means to urge lateral movement of the plunger and valve controlled means for the discharge of air from the cylinder adapted to be opened through lateral movement of the plunger.

2. In a compressed air liquid elevator, a pump cylinder, a pipe for conveying air under pressure to said cylinder, a valve in said pipe, a pipe for discharging air from the cylinder, a spring seated valve in said discharge pipe, a spring normally tending to open said spring seated valve, a yoke interposed between the last mentioned spring and the valve, a piston mounted to reciprocate in said cylinder, springs normally tending to actuate the piston against the pressure of air in the cylinder, a plunger operatively connected with said piston and with the yoke aforesaid, said plunger having means to actuate the valve in the air supply pipe, and means to actuate the plunger to move the yoke against the resistance of the spring secured thereto.

3. In a compressed air liquid elevator, a pump cylinder, a pipe for conveying air under pressure to said cylinder, a valve in said pipe, a pipe for discharging air from the cylinder, a spring seated valve in said discharge pipe, a spring normally tending to open said spring seated valve, a yoke interposed between the last mentioned spring and the valve, a piston mounted to reciprocate in said cylinder, springs normally tending to actuate the piston against the pressure of air in the cylinder, a plunger operatively connected with said piston and slidably mounted in the yoke aforesaid, said plunger provided with means to actuate the valve in the air supply pipe, an inclined shoulder on said plunger, and means engaging said shoulder to actuate the yoke against the resistance of the spring secured thereto.

4. In a compressed air liquid elevator, a pump cylinder, a piston operable in said cylinder, means to urge movement of the

piston to a normal position, means of compressed air supply to move the piston counter to said means, a cut off valve for the second mentioned means, means normally
5 maintaining said valve open, said latter means being operable to permit closing of the valve through movement of the piston, and an outlet valve for the cylinder controlled through movement of the third men-

tioned means and adapted to open after 10 closing of the first named valve.

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

WALTER B. DIXON.

Witnesses:

L. S. NEAL.

P. W. ZIGLAR.