

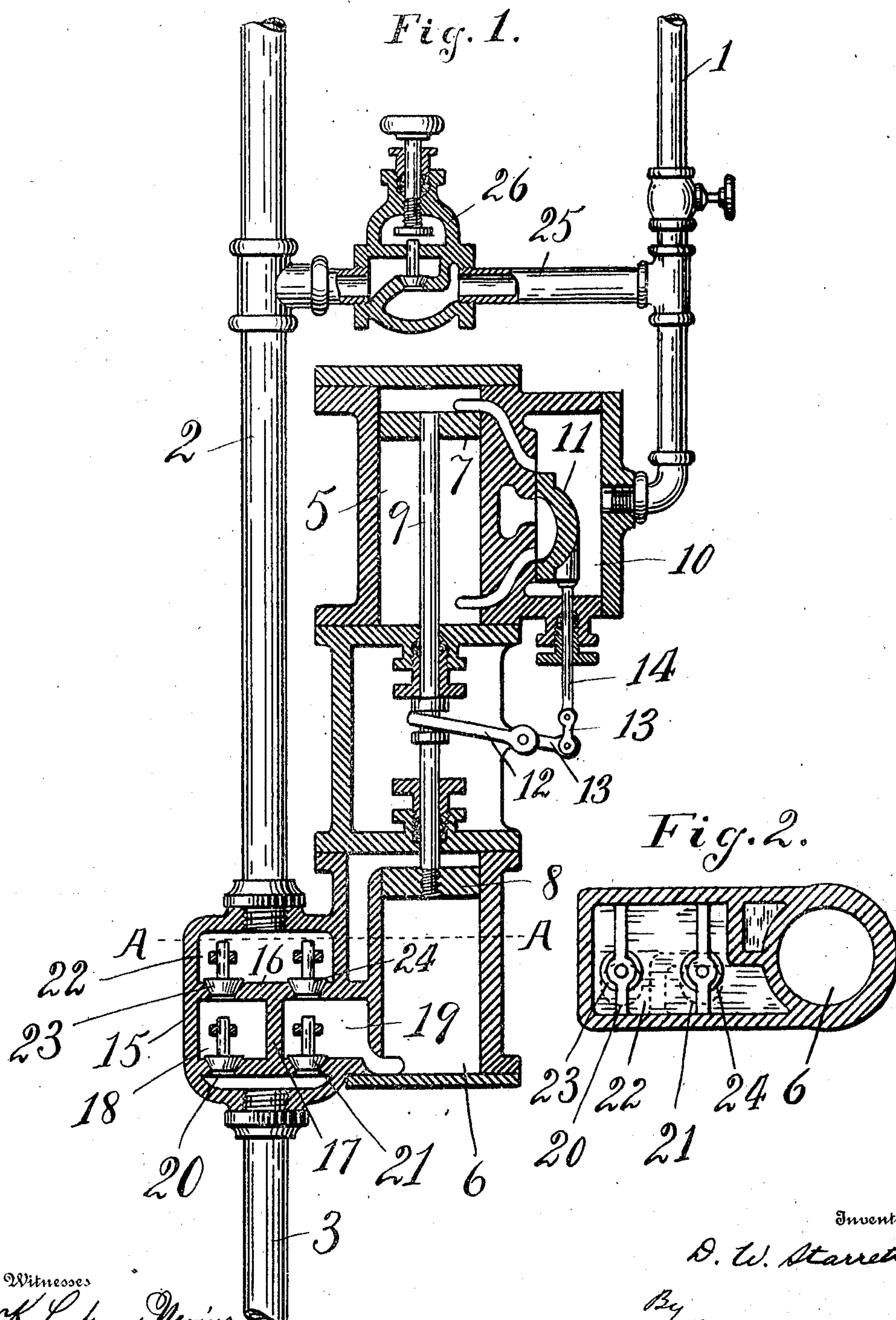
No. 876,848.

PATENTED JAN. 14, 1908.

D. W. STARRETT.

PUMP OPERATED BY COMPRESSED AIR.

APPLICATION FILED FEB. 12, 1904. RENEWED APR. 8, 1907.



Witnesses
K. Lockwood Nevins
Bessie Gorfinkel

Inventor
D. W. Starrett
By Francis M. Leight
Attorney

UNITED STATES PATENT OFFICE.

DANVILL W. STARRETT, OF SAN FRANCISCO, CALIFORNIA.

PUMP OPERATED BY COMPRESSED AIR.

No. 870,848.

Specification of Letters Patent.

Patented Jan. 14, 1908.

Application filed February 12, 1904. Serial No. 193,331. Renewed April 8, 1907. Serial No. 367,071.

To all whom it may concern:

Be it known that I, DANVILL W. STARRETT, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Pumps Operated by Compressed Air, of which the following is a specification.

My invention relates to improvements in compressed air pumps, the object of my invention being to provide a simple form of compressed air pump by means of which water may be elevated to any height by means of compressed air at any pressure greater than the atmosphere.

My invention belongs to that class described and claimed by me in United States Letters Patent granted to me May 29th, 1906, No. 821,677, in which there is provided in the water discharge pipe a check valve, and to said discharge pipe above the check valve there leads a branch from the compressed air pipe, in which branch the opening is sufficiently large, having regard to the height of the discharge pipe and the pressure of the compressed air, to admit a sufficiently large proportion of air to water to distribute the water through the whole length of the pipe to such an extent that the weight of the entire amount of water shall not overbalance the pressure of the compressed air; whereby when water escapes from the top of the discharge pipe the pressure of the compressed air may be utilized to force water through the check valve into the discharge pipe to supply the place of that which has been discharged from the top thereof.

This invention consists of a simple construction for effecting the above results.

In the accompanying drawing, Figure 1 is a vertical section of the apparatus, certain of the pipes however being shown in side elevation; Fig. 2 is a horizontal section on the line A—A of Fig. 1.

Referring to the drawing, 1 represents the compressed air pipe, 2 the water discharge pipe, and 3 the water suction pipe.

4 represents a common steam pump comprising a steam cylinder 5 and a pumping cylinder 6. In the present instance the steam pump is preferably operated by means of compressed air. The pistons 7 and 8 in these cylinders are of substantially the same diameter and are connected by a piston rod 9.

10 is the valve chamber having the valve 11 therein operated from the piston rod 9 by the lever 12, links 13 and rod 14.

15 represents a chamber divided into upper and lower portions by a horizontal partition 16, the lower portion being again divided by a vertical partition 17 into compartments 18 and 19, connected respectively with the upper and lower ends of the pumping cylinder. These compartments contain inlet valves 20, 21. The upper portion or compartment 22 contains check valves 23, 24, communicating respectively with the compartments 18, 19.

25 represents a branch or jet pipe leading from the compressed air pipe to the water discharge pipe and having therein an adjustable check valve 26.

The operation of the apparatus is as follows. Supposing the parts to be in the position shown in Fig. 1, the air entering the upper portion of the cylinder 5 forces the piston 7 downwards, likewise forcing down the piston 8 and drawing water from the pipe 3 through the valve 20 into the chamber 18 and thence to the upper end of the pumping cylinder 6. Upon the return stroke of the piston caused by the admission of compressed air to the lower end of the cylinder 5, the water in the upper portion of the pumping cylinder is forced back into the compartment 18, and thence through the valve 23 into the compartment 22. At the same time water is being drawn through the valve 21 into the compartment 19 and thence in the lower end of the pumping cylinder, which, again, on the return stroke of the piston, is forced through the valve 24 into the chamber 22. During the whole of this operation compressed air is also passing through the branch pipe 25 into the water discharge pipe, and it is only when the amount of air so forced through said branch or jet pipe is sufficient to distribute the water along the discharge pipe to such an extent that the pressure of the whole of the water therein upon the valves 23, 24 is less than the pressure of the compressed air, that any water passes through said valves. As soon as water is discharged from the top of the discharge pipe by reason of the continued flow of the compressed air into the bottom of said discharge pipe, then immediately the pump begins to work and water is forced

through the valves 23, 24, into the discharge pipe to supply the place of the water that had been discharged from the top of said pipe.

I claim:—

- 5 1. In an apparatus of the character described, the combination of the compressed air pipe, the water discharge pipe, the inlet valve for the water, the check valve therefor at the bottom of said water discharge pipe, a
10 pump discharging into the space between the inlet and check valves and having a piston operated by the compressed air, and a passage from the compressed air pipe to the water discharge pipe sufficiently large in re-
15 lation to the compressed air pressure and the height of the discharge pipe to distribute the air therein sufficiently to reduce the weight of the water upon the check valve below the compressed air pressure whereby said pres-
20 sure can operate the pump water through said check valve, substantially as described.
2. In an apparatus of the character described, the combination of a compressed air pipe, a water discharge pipe, an inlet valve, a
25 check valve at the bottom of the water discharge pipe, and a pair of cylinders having pistons therein of substantially uniform diameter, said pistons being connected to work in unison, one of said cylinders being con-
30 nected with the compressed air pipe to act as a compressed air motor, and the other cylinder being connected with the chamber between the inlet and check valve to act as a pump, and a passage from the compressed
35 air pipe to the water discharge pipe sufficiently large in relation to the height of the discharge pipe and the compressed air pressure to distribute the air in said discharge pipe sufficiently to reduce the weight of the

water upon the check valve below the com- 40
pressed air pressure, whereby said pressure can operate said pistons to force water through said check valves, substantially as described.

3. In an apparatus of the character de- 45
scribed, the combination of a compressed air pipe, a water discharge pipe, a chamber at the bottom of said water discharge pipe hav-
ing two lower compartments each having an inlet valve therein, a cylindrical pump, the 50
opposite ends of which connect respectively with said compartments, a compressed air cylindrical motor having a piston substan-
tially equal in diameter to the pump piston and connected therewith to move in unison, 55
said compressed air motor being connected with the compressed air pipe to be operated thereby, an upper compartment having
check valves communicating respectively with the lower compartments, said upper 60
compartment also communicating with the water discharge pipe, and a passage from the compressed air pipe to the water discharge
pipe sufficiently large to distribute the air through the latter pipe so as to reduce the 65
weight of the water upon either of said check valves below the compressed air pressure, whereby the pump can operate under said
compressed air pressure to force water there-
70 through, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

D. W. STARRETT.

Witnesses:

FRANCIS M. WRIGHT,
BESSIE GORFINKEL.