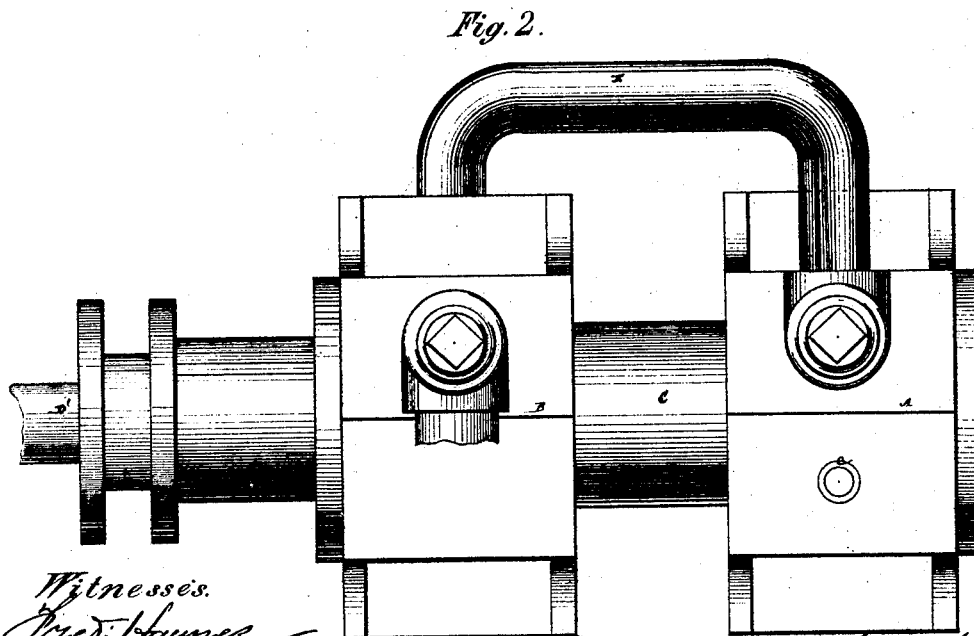
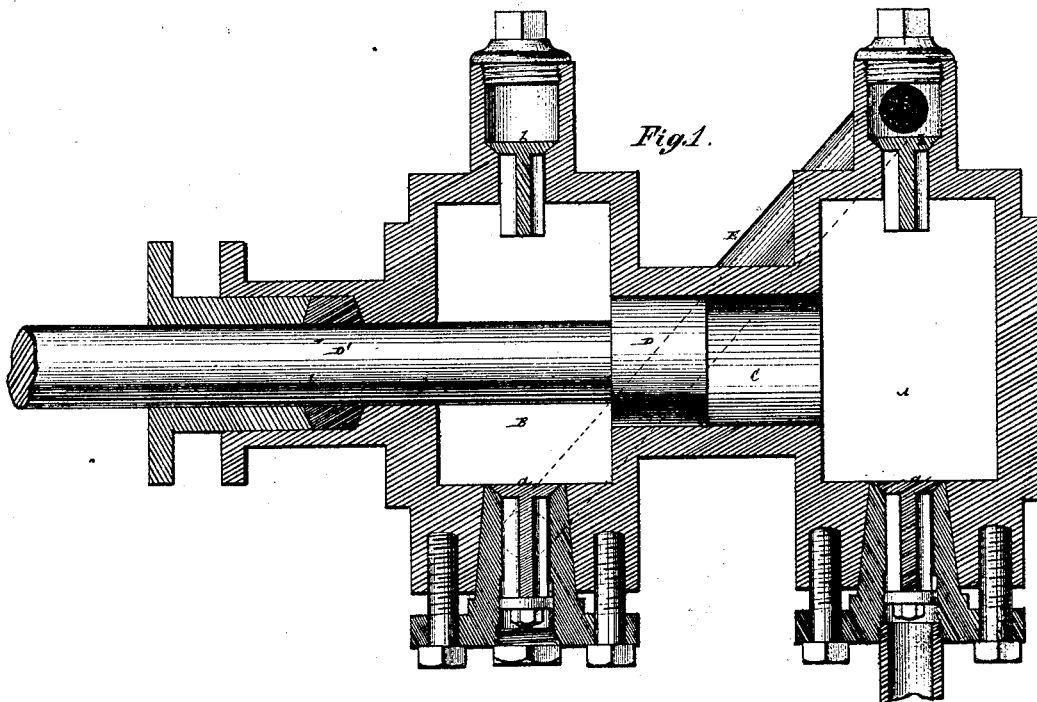


R. M. Marchant,

Air Pump.

No. 112,060.

Patented Feb. 21. 1871.



Witnesses.
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ROBERT MUDGE MARCHANT, OF LONDON, ENGLAND.

Letters Patent No. 112,060, dated February 21, 1871.

IMPROVEMENT IN AIR-PUMPS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, ROBERT MUDGE MARCHANT, of London, England, have invented a new and useful Improvement in Pumps for the Compression of Air, Gases, and other Aeriform Fluids or Vapors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing forming part of this specification, and in which—

Figure 1 represents a longitudinal vertical section of a pump constructed in accordance with my improvement, and

Figure 2, a plan of the same.

Similar letters of reference indicate corresponding parts in both figures.

This invention relates to a pump for compressing various aeriform fluids or vapors, including air, steam, or gas, the plunger of which pump, as in the pump for which Letters Patent of the United States were issued to me on the 20th day of December, 1870, works under water, said water being confined under or between a volume or volumes of the fluid or vapor under compression, by causing the fluid or vapor to pass or be delivered by the beat of the pump, and by its lighter specific gravity through the water from below to a storage chamber or pipe for future use, as required.

The invention consists in a combination of two or more water-chambers, preferably provided with inlet and outlet valves above and below, and having a plunger arranged to work alternately in a reverse manner on the water in each pair of said chambers, and so that it causes, in its one stroke, the steam, air, or gas to pass and be delivered up through the water in the one chamber; and in its return stroke to be passed by a connecting pipe or passage up through the water in the adjacent chamber where said steam, air, or gas is compressed or made to undergo further compression by reason of the reduced capacity of such adjacent or second chamber as produced by the extension of the plunger-rod through it.

Under this combination or arrangement a valve in the plunger or bucket may be dispensed with.

Referring to the accompanying drawing—

A and B represent two chambers, arranged side by side at any suitable distance apart and connected intermediately of their height by a horizontal pump-barrel, C, that is fitted with a reciprocating plunger, D, the rod D' of which extends outward through the second chamber B.

The first chamber A, as also the second chamber B, if desired, is fitted with a lower inlet valve, *a*, and upper outlet valve *b*, for the steam air, or gas being

compressed, and a connection made by a pipe, E, between the upper end of the first chamber and lower end of the second chamber.

The operation of the pump is as follows:

The chambers A and B are first filled or partly filled with water above the height at which the plunger stands.

This causes the plunger D, as it is reciprocated alternately, to raise the water in the one chamber and to lower it in the other.

The lowering of the water in the chamber A creates a vacuum in the upper portion of said chamber, into which the steam, air, or gas entering by the one valve, *a*, and passing up through the water is delivered.

This occurs during the back stroke of the plunger relatively to the chamber A.

In the return stroke of the plunger, the air, steam, or gas thus stored, is forced out through the valve *b* of the chamber A, and caused to enter by the pipe E the lower end of the chamber B, where it passes up through the water into the vacant space above produced by the back stroke of the plunger relatively to said chamber.

In the next return stroke of the plunger the steam, air, or gas thus stored in the second chamber is compressed or further compressed by reason of the reduced capacity of the chamber B as produced by the rod D' passing through it, a fresh charge of air, steam, or gas at the same time being drawn into the chamber A.

From the chamber B the steam, air, or gas thus compressed, may be drawn or utilized, as required, or be taken in a like manner, as before, to a succeeding water-chamber for further compression, the plunger-rod in such case being of greater diameter where it passes through the additional chamber than at its passage through the second chamber, and so on for any number of water or storing chambers, as desired, according to the amount of compression required, the capacity of each succeeding chamber being reduced by the varying space occupied by the plunger or its rod in each chamber.

The water may be supplied to the chambers by an inlet, *c*, from a cistern through the intervention of a regulating-valve, so that the required quantity can be supplied at each stroke of the plunger to make good the loss sustained by leakage and by saturation of the steam, air, or gas passing through said chamber.

What is here claimed, and desired to be secured by Letters Patent, is—

1. The combination of a series of two or more

water and storage-chambers, A B, the pump-barrel C, the plunger D, with its rod D', and the connecting-pipe or passage E between each consecutive pair of chambers, substantially as and for the purpose or purposes herein set forth.

2. The arrangement of the water and storage-chambers A B, the inlet and outlet valve *a b*, the connecting-pipe or passage E, the pump-barrel C,

and the plunger D with its rod D', essentially as described.

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