

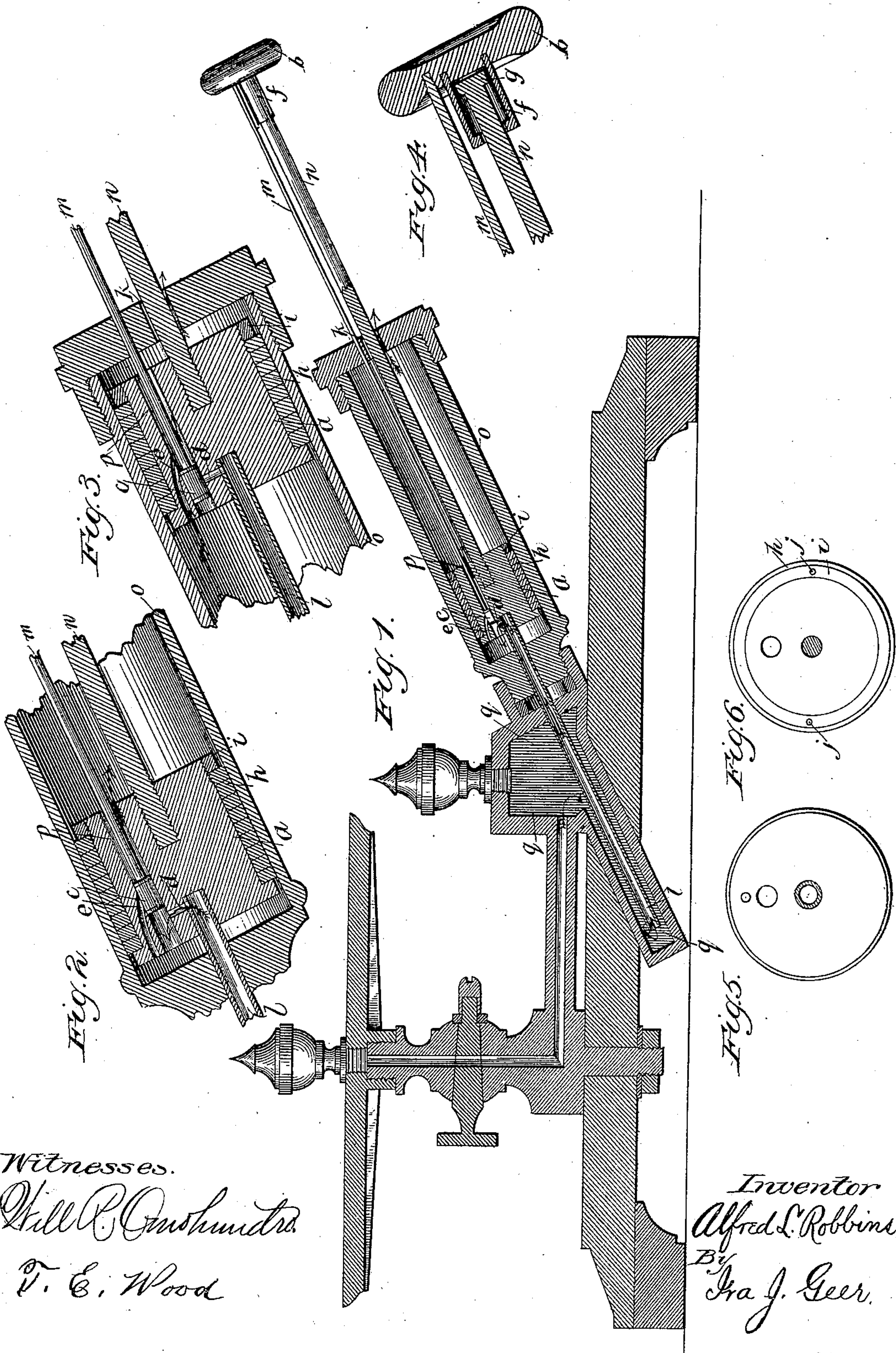
(No Model.)

A. L. ROBBINS.

AIR PUMP.

No. 313,243.

Patented Mar. 3, 1885.



Witnesses.

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# UNITED STATES PATENT OFFICE.

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## AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 313,243, dated March 3, 1885.

Application filed May 19, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, ALFRED LEWIS ROBBINS, a citizen of the United States, residing at the city of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Air-Pumps, of which the following is a specification.

My invention relates to improvements in air-pumps in which valves for the admission and exhaustion of air are operated by mechanical means.

The objects of my improvements are, first, to provide a system of valves which shall not be affected in their operation as the air becomes rarefied in the receiver; second, to furnish a combination of passages through the piston-head for the easy ingress and egress of air; third, to furnish a combination of valves in the piston-head by which the ports shall be absolutely closed before the piston begins to move; fourth, to provide a means of operating these valves.

I accomplish these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a sectional view of the whole air-pump. Fig. 2 is a section of a portion of the cylinder and of the piston-head, representing the position of the valves at the beginning of the upstroke; Fig. 3, also a section of a portion of the cylinder and of the piston-head, representing the position of the valves at the beginning of the downward stroke. Fig. 4 represents the device where the power is applied for operating the valves and piston. Fig. 5 is a plan view of the bottom of the piston-head, and Fig. 6 a plan view of the top of the piston-head.

Similar letters refer to similar parts throughout the several views.

Referring to letters on the drawings, *o* represents the cylinder of an air-pump, formed and attached to a stand or base in the usual way. In the cylinder *o* slides the piston-head *a*, into which is securely screwed the piston-rod *n*, at the extremity of which is the handle *b*, where the power is applied for operating the piston. The piston-head *a* is packed with suitable packing-washers, *h*, so as to closely fit the cylinder *o*. These washers *h* are tightened by screwing down the circular ring *i*, which is provided with threads

on the inside, upon the top of the piston-head *a*, which is provided with corresponding threads, by means of the two key-holes *j j*, as shown at Fig. 6.

*l* is a tubular rod securely fastened by a thread and screw into the bottom of the piston-head *a*, and extending into the air-chamber *q q* of the pump.

Through the piston-head *a*, and parallel to the sectional line of the cylinder, (shown in Fig. 1,) is a circular orifice, *p*. Connecting with this orifice *p* are two ports—the port *d*, which opens into the upper end of the tubular rod *l*, and the port *e*, which opens into the lower part of the cylinder. The opening of the port *d* into the circular orifice *p* is below the opening of the port *e*.

Into the circular orifice *p* extends a valve-rod, *m*, parallel to the piston-rod *n*, firmly fixed at the upper end to the handle *b*.

At the lower extremity of the valve-rod *m* is attached a circular valve, *c*, which is made to fit closely within the orifice *p* by means of suitable packing. This valve *c* slides within the orifice *p*, and is of such a length that it will tightly cover the ports *d* and *e*, so as to, when in that position, absolutely prevent the passage of air, and of a length that, when the piston-head *a* and valve *c* are in any combination of movement, neither port can be opened until the other is completely closed.

Around the piston-rod *n* and through the upper cylinder-head is left a space, *k*, for the free escape of the air from the upper portion of the cylinder *o*.

At the upper extremity of the piston-rod *n* is a collar or head, *g*, (see Fig. 4,) over which extends a sleeve, *f*, shaped substantially as represented in Fig. 4, and firmly attached to the handle *b*, but sliding freely over the end of the rod *n* as far as the head or collar *g* will permit. Also to the handle *b* is firmly attached the rod *m*.

The direction of the air when the pump is in operation is represented by arrows in the several drawings.

The mode of operation is as follows: Let the piston-head *a* be at the bottom of the cylinder *o* and the power applied to the upper end of the piston-rod *n* at the handle *b*. The sliding valve *c*, which is attached to the rod *m*, is first drawn upward from the position it oc-



cupies in Fig. 3 to the one it occupies in Fig. 2, thus first closing the port *e*, and then, while keeping port *e* closed, opening port *d*. The sliding valve *c* is stopped at the position it occupies in Fig. 2 by the sleeve *f* bearing against the bottom of the head or collar *g*. As the power is continued, the piston-head *a* is drawn upward and a vacuum is created in the cylinder below it, into which air rushes from the receiver through the tubular rod *l* and open port *d*. When the piston-head *a* has completed its upward stroke and the power is reversed, the sliding valve *c* is first pushed downward from the position it occupied during the upward stroke (shown in Fig. 2) to the one it occupies in the downward stroke, (shown in Fig. 3,) thus first closing the port *d*, and then, while keeping the port *d* closed, opening the port *e*, out of which the air is forced as the piston-head descends. When the piston-head reaches the bottom of the stroke, the air is exhausted from the cylinder.

The advantages obtained by these improvements are several and important. In ordinary air-pumps, with valves operated by atmospheric pressure, but a partial vacuum can be obtained, for when the air becomes rarefied the valves do not fully perform their function. In my improvement the valves, being moved by mechanical power, are not at all affected by the rarity of the air in the receiver. Also in this improvement the valves are closed before the piston begins the stroke, and not as it begins to move, which precludes the admission or return of even the smallest quantity of air. The perforation of the piston-head, in the manner as described, by the ports *e* and *d* and the orifice *p*, in combination with the valve *c*, provides in the simplest manner for

the free ingress and egress of air to and from the lower portion of the cylinder.

The arrangements for regulating the passage of air are simple and will not get out of order.

The combination of the ports with the length of the valve *c* is such that one port must be completely closed before the other begins to open.

The device for operating the valve by the same power used to move the piston is valuable and effective.

By means of an air-pump with these improvements better results can be secured and a more perfect vacuum formed than by any pump now in use known by me.

I am aware that prior to my invention air-pumps have been made with valves operated otherwise than by atmospheric pressure, and also that air-pumps have been made to operate with certain combinations in a hollow piston. I therefore do not claim such combinations, broadly; but

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, in air-pumps, of the piston *a*, provided with the orifice *p* and ports *d* and *e*, with the valve *c*, rod *m*, and tubular rod *l*, substantially as described, and for the purpose specified.

2. The combination of the sleeve *f*, valve-rod *m*, and handle *b*, to operate with the piston-rod *n* and collar *g*, substantially as described, and for the purpose specified.

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Witnesses:

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