

W. JOHNSTON.
Air-Compressors.

No. 221,318.

Patented Nov. 4, 1879.

Fig. 1.

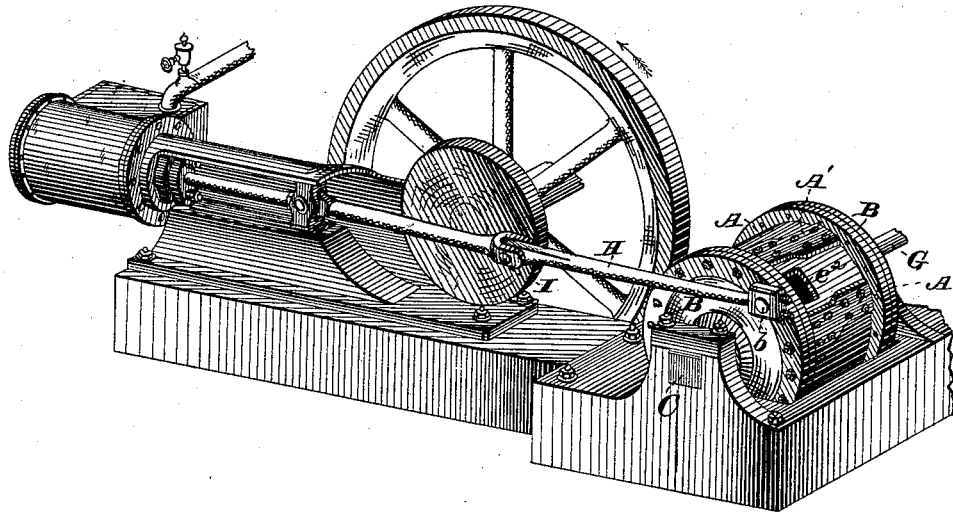


Fig. 2.

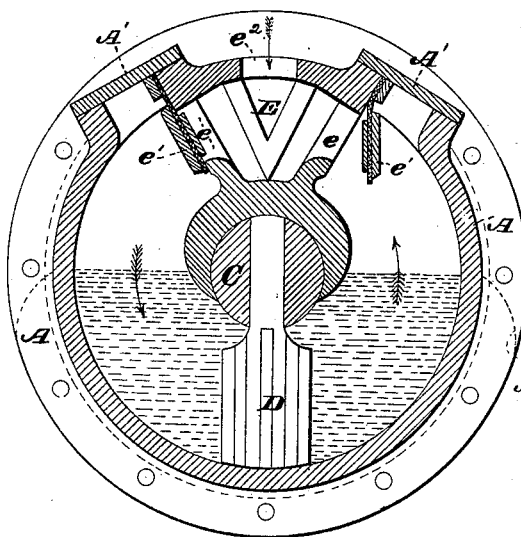
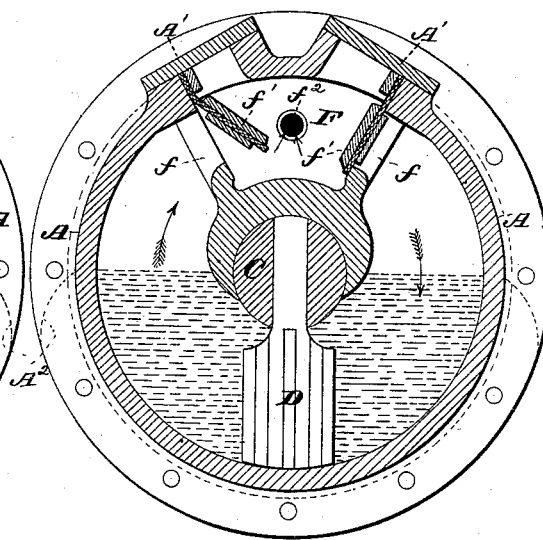


Fig. 3.



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Fig. 4.

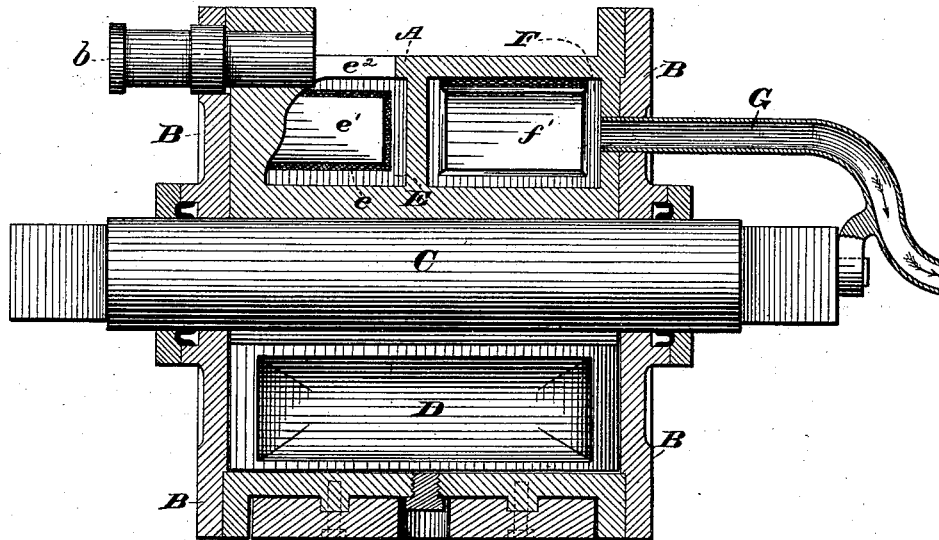
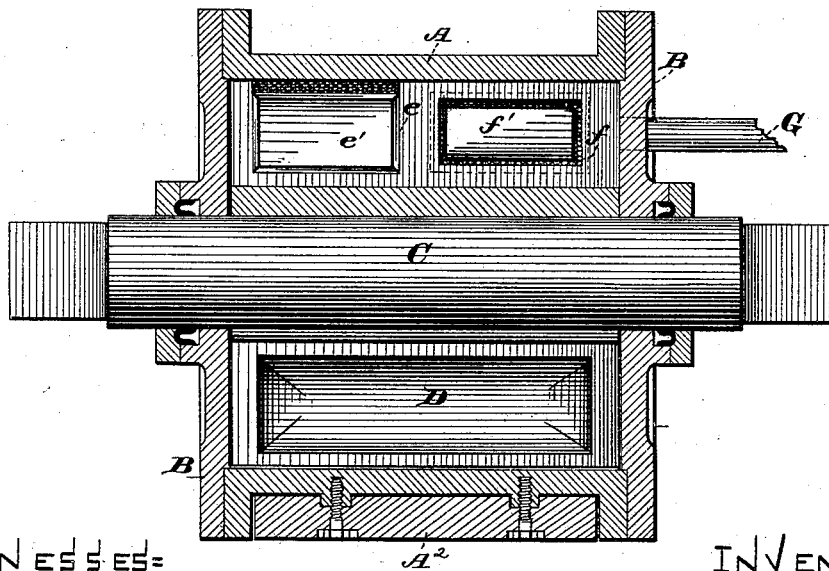


Fig. 5.



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Jas. C. Hutchinson.
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UNITED STATES PATENT OFFICE.

WILLIAM JOHNSTON, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN AIR-COMPRESSORS.

Specification forming part of Letters Patent No. **221,318**, dated November 4, 1879; application filed April 21, 1879.

To all whom it may concern:

Be it known that I, WILLIAM JOHNSTON, of Washington city and county, District of Columbia, of the United States of America, have invented certain new and useful Improvements in Air-Compressors; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a perspective view of my device as arranged for use. Fig. 2 is a vertical cross-section upon a line passing through the inlet-valves. Fig. 3 is a like view of the same upon a line passing through the outlet-valves. Fig. 4 is a central longitudinal section of said device upon a line passing through the air-supply opening, and Fig. 5 is a like view of the same upon a line passing through the casing just outside the outlet-valve chamber.

Letters of like name and kind refer to like parts in each of the figures.

The object of my invention is to enable air to be compressed in an economical manner, and with less friction and loss of power than has heretofore been practicable; to which end it consists, principally, in an air-compressor in which are combined the following elements, viz: a fixed shaft or bearing; a cylindrical casing inclosed at its ends, journaled upon said shaft, and provided within its upper portion with valve-chambers that contain inlet and outlet valves, and extend downward to the upper side of said shaft, a fixed partition which extends between the lower side of the latter and the lower wall of said casing, and a liquid that substantially fills the lower half of said casing, substantially as and for the purpose hereinafter specified.

It consists, further, in the construction of the valve-chamber, substantially as and for the purpose hereinafter shown.

It consists, finally, in the device as a whole, its several parts being constructed and combined to operate in the manner and for the purpose hereinafter set forth.

In the annexed drawings, A represents a cylindrical casing, which is inclosed at its ends by means of heads B, and is journaled upon a fixed shaft, C, which passes through the centers of said heads, the joints between said

parts being provided with air and water tight packing.

From the lower side of the shaft C a lug, D, extends radially downward and fills the space between said shaft, the lower side of the casing A, and the heads B, so as to divide the lower portion of said casing into two compartments. If desired, the lower edge and the ends of said lug may be provided with suitable packing, whereby a water-tight joint may be produced between the same and the contiguous surfaces.

At the upper side of the casing A are two valve chambers, E and F, arranged end to end between the ends of said casing, the first named of which chambers is for the inlet and the last for the outlet of air. The walls of each of said chambers are formed upon radial lines, and extend between the upper wall of said casing and the shaft C, the upper side of which shaft is inclosed by a semi-cylindrical bearing that is cast with and forms part of the walls of said chambers.

The side walls of the inlet and outlet chambers have relative angles of about sixty degrees, and within each of said walls is an opening, *e* or *f*, respectively, which affords communication between the interiors of said chambers and the interior of the casing A.

The openings *e* of the inlet-valve chamber are each provided with a flap or clock valve, *e'*, which swings outward into the interior of the casing A, while the openings *f* of the chamber F are inclosed by similar valves, *f'*, that open inward into said valve-chamber.

An opening, *e*², is provided between the upper side of the inlet-chamber E and the exterior of the casing A, through which air may enter said chamber, while from the outlet-chamber F an opening, *f*², extends laterally outward through the contiguous head B. Suitable openings, through which access may be had to the valves *e'* and *f'*, are provided in the upper wall of the casing A, and are inclosed by means of removable covers A'.

Water is now inserted within the casing until its interior is about one-half full, and said casing is then caused to oscillate upon its shaft, the movement in each direction being continued until the front wall of the valve-chambers is nearly horizontal and impinges

upon the surface of said water, when the following-described result will be obtained, viz: The front inlet-valve, e' , in the direction of the movement, will be closed, and the outlet-valve f'' of the same side opened, as the valve-chambers approach the water-line, and air contained between the former and the surface of the water will be forced into the outlet-chamber F , and from the same into a discharge-pipe, G , which is attached to the outer end of the opening f^2 , the pressure given to said air being governed by the relative quantity permitted to escape.

While air is being expelled from one side of the casing it is being admitted to the opposite side through the opening e^2 , inlet-chamber E , and valved opening e , the valve f' upon such side being closed, the alternate filling and discharging air from each side of said casing being thus automatically caused by the oscillation of said casing.

In consequence of the comparative immobility and incompressibility of the water, it presents a substantially solid bearing, against which the air is compressed by the downward movement of the valve-chambers, which chambers perform in such respect the office of a solid piston. The office of the lug or partition D is to hold the water stationary and prevent it from oscillating, as would otherwise be the case, the surface of said water being at all times rendered practically horizontal by the operation of said partition.

When a high pressure of air is desired, two or more compressors, having regularly-decreasing capacity, may be placed end to end upon the same axial bearing, and the second and each succeeding compressor receive compressed air from that next preceding, the degree of compression thus attainable being practically unlimited.

In order that the temperature of the compressed air may be kept down, I usually admit a small stream of water with the air-supply, all surplus being passed out with the air-discharge, and afterward separated therefrom in a receiver.

The casing A is, preferably, driven by means of a connecting-rod, H , that at one end is journaled upon a crank-pin, b , which projects outward from one of the heads B , while at the other end said connecting-rod is journaled upon the crank I of a steam-engine; but any

other means for producing the oscillating motion may be used, if desired.

The mechanism described will operate equally well as a pump, or for exhausting gas or air from mines or other places. When used as a pump the cylinder should be submerged, and preferably reversed; or if above the water, a suction-pipe should be connected with the air-supply opening e^2 .

To counteract the tendency of the oscillating casing to shake the whole machine when moving with much velocity, I apply to the lower side of said casing weights A^2 , which counterbalance the weight of the valve-chambers and valves, and cause said casing to move smoothly and without jar.

Having thus fully set forth the nature and merits of my invention, what I claim as new is—

1. An air-compressor in which are combined the following elements, viz: a fixed shaft or bearing; a cylindrical casing inclosed at its ends, journaled upon said shaft, and provided within its upper portion with valve-chambers that contain inlet and outlet valves and extend downward to the upper side of said shaft; a fixed partition which extends between the lower side of the latter and the lower wall of said casing, and a liquid that substantially fills the lower half of said casing, substantially as and for the purpose specified.

2. In combination with the casing A and pivotal bearing-shaft C , the valve-chambers E and F , having their side walls formed upon radial lines having relative angles of about sixty degrees, and operating as pistons or plungers, substantially as shown.

3. The hereinbefore-described air-compressor, in which the casing A , inclosing-heads B , fixed bearing-shaft C , partition or lug D , inlet-chamber E , having the valved openings e and air-supply opening e^2 , and the outlet-chamber provided with the valved openings f and air-discharge opening f^2 are combined to operate in the manner and for the purpose substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 15th day of April, 1879.

WILLIAM JOHNSTON.

Witnesses:

HENRY C. HAZARD,
JAS. E. HUTCHINSON.