(No Model.) 2 Sheets—Sheet 1.

H. C. SERGEANT.

COMPRESSOR.

No. 422,255. Patented Feb. 25, 1890.

Fig. 2

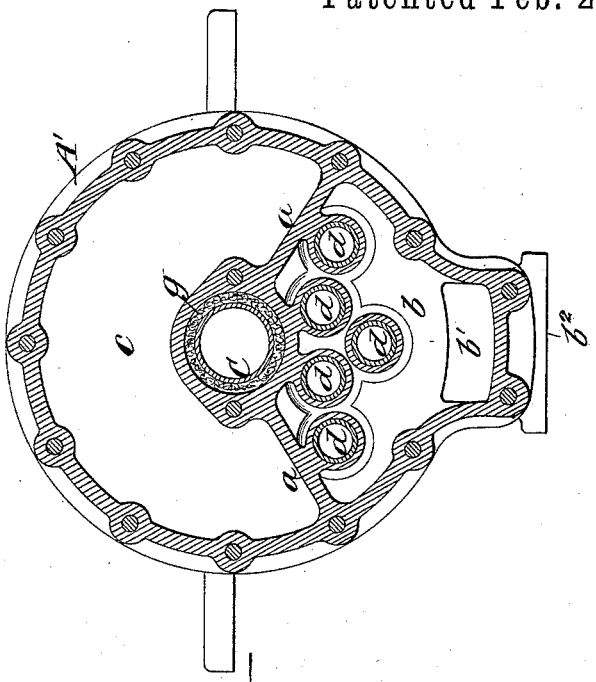
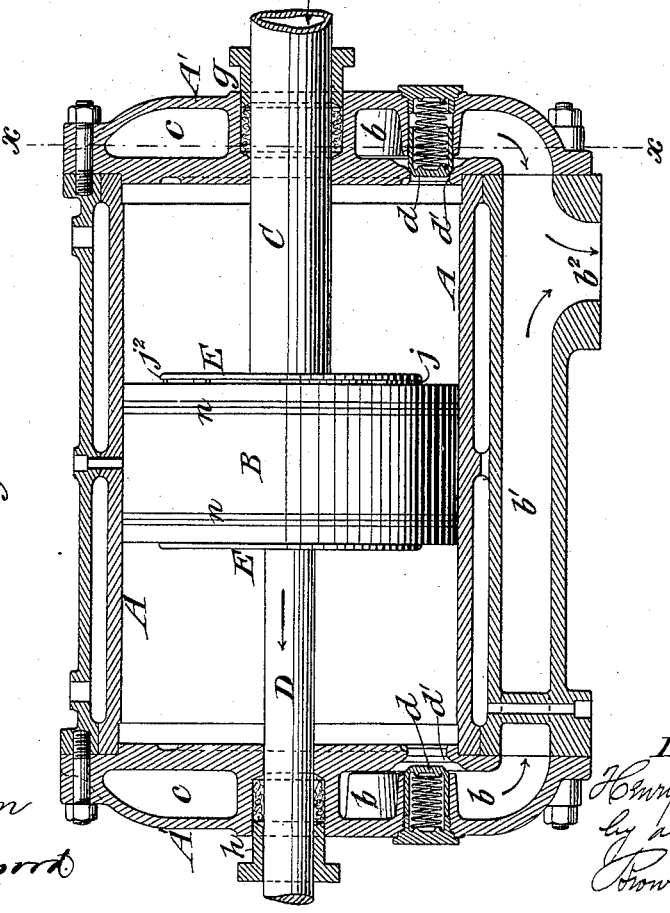


Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

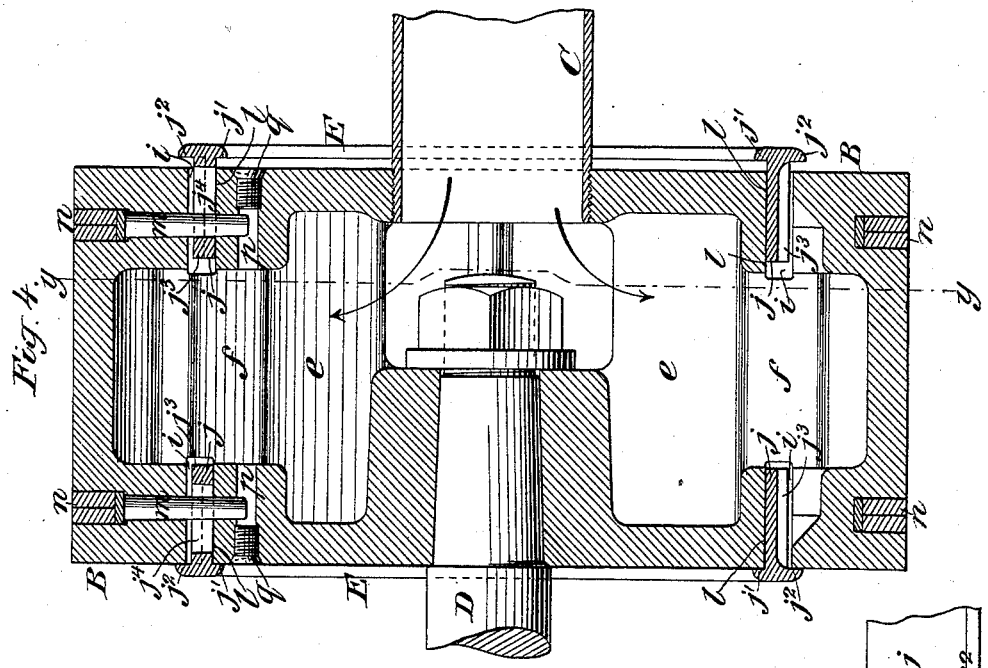


Fig. 5.

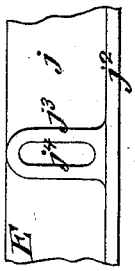
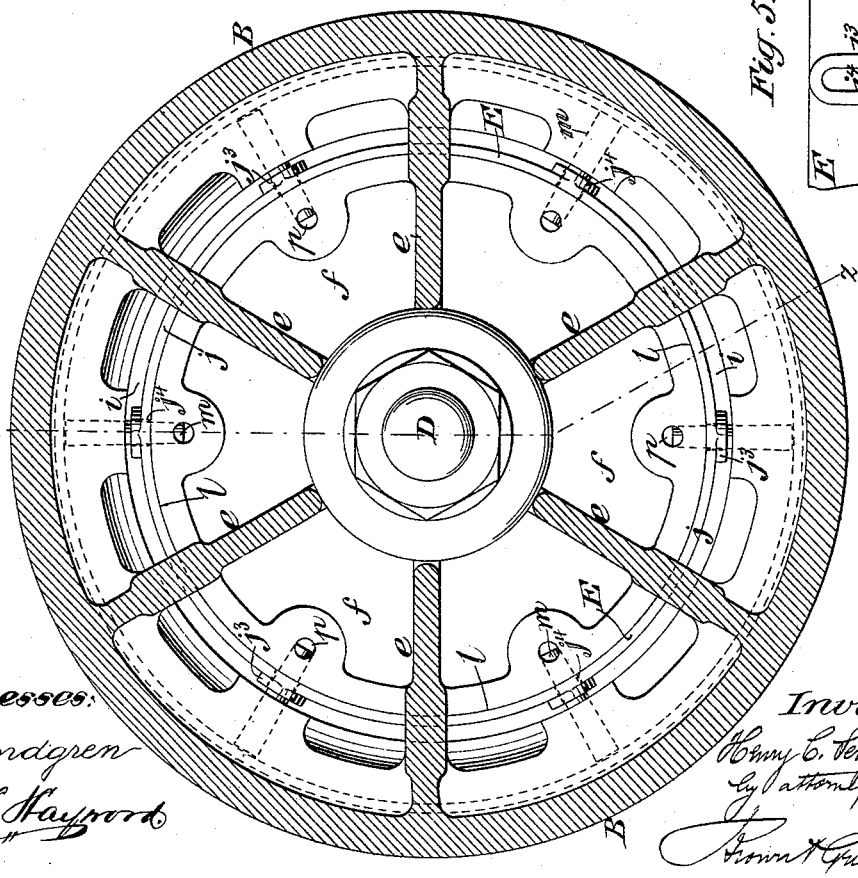


Fig. 3.



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UNITED STATES PATENT OFFICE.

HENRY C. SERGEANT, OF NEW YORK, N. Y.

COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 422,255, dated February 25, 1890.

Application filed August 30, 1889. Serial No. 322,453. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. SERGEANT, of the city of New York, county of New York, and State of New York, have invented a new and useful Improvement in Compressors, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to compressors such as are commonly known as "air-compressors," but which are also applicable for the compression of various gaseous or aeriform bodies.

I will proceed to describe my invention with reference to the accompanying drawings, and afterward point out its novelty in claims.

Figure 1 represents a central longitudinal section of the cylinder of a double-acting air-compressor and a longitudinal outside view of the piston and piston-rods thereof, illustrating my invention. Fig. 2 is a transverse sectional view taken in the line *x x* of Fig. 1. Fig. 3 represents a transverse section of the piston in the line *y y* of Fig. 4. Fig. 4 is a sectional view of the piston, taken in the line *z z* of Fig. 3. Fig. 5 represents an outside view of a portion of a ring-valve, which constitutes an essential feature of my invention.

Similar letters of reference designate corresponding parts in all the figures.

A designates the cylinder, the side walls of which are hollow to constitute a water-jacket for the circulation of cooling-water, and the heads A′ of which are also hollow, each containing a partition *a*, (see Fig. 2,) dividing the head into two compartments *b* and *c*, of which *b* constitutes the valve-chamber for discharge-valves *d*, and *c* constitutes a water-space for the circulation of water for cooling the cylinder. The valve-chambers *b* in the two cylinder-heads both communicate with a longitudinal passage *b′* on the outside of the cylinder, and the said passage *b′* is to have the discharge-pipe connected with it at b^2. The discharge-valves *d* are fitted to seats *d′* in the cylinder-heads and open outward from the cylinder to the chambers *b*. The discharge-valves *d* may be of any suitable kind, and are represented as of a well-known kind; but as neither they nor the valve-chambers *b b* in the cylinder-heads constitute any part of the present invention no further description of them is necessary.

B designates the piston, which is hollow and strengthened internally by radial ribs *e*, and has connected with it a central tube C, which communicates with its interior cavity *f*. This tube may constitute a piston-rod; but in any case it constitutes an inlet-pipe for the air or other gaseous body to be compressed. The said tube works through a stuffing-box *g* in one of the cylinder-heads, and its outer end may open to the atmosphere or to a cold-air box or to any source of supply for the air or gaseous body to be compressed. In the example represented the piston is furnished on the opposite side to the pipe C with a solid rod D, passing through a stuffing-box *h* in the other cylinder-head, for the purpose of making connection between the piston and the motor for driving it.

The internal cavity of the piston, with which the tube or pipe C communicates, is opened and closed by valves E E to form communication between the inlet-pipe C and the cylinder on opposite sides of the piston alternately; but the said cavity is otherwise closed. An annular passage *i* is provided in each end of the piston for the reception of one of two ring-valves E. These valves are constructed substantially T-shaped in their transverse section, as shown in Fig. 4. This form gives them an annular stem *j* and a double-flanged head *j′* j^2, the flange *j′* forming a valve-face within the inner circumference and the flange j^2 forming a valve-face outside of the outer circumference of said stem, the said valve-faces closing against seats which are constituted by those portions of the faces of the piston immediately within the inner circumference and outside of the outer circumference of the annular passage *i*. The inner circumference of the passage *i* is turned truly to form a guide *l* for the annular valve-stem, and the inside circumference of the said stem is turned to fit easily to the so-formed cylindrical guide. The outside circumference of the stem *j* is made considerably smaller than the exterior circumference of the passage *i*, in order that when the valve is opened there may be a free communication between the cylinder and the interior of the piston; but at certain intervals the said stem is thickened

by bosses j^3, as shown in Figs. 3, 4, and 5, to give greater strength at such intervals, where slots j^4 are provided in the said stem, as shown in Figs. 4 and 5, the said slots running in a direction lengthwise of the piston and having inserted through them pins *m*, which are inserted into pin-holes provided in the piston radially thereto, the said holes intersecting the passages *i*. The purpose of these pins is to prevent the valves from getting away from the piston and to restrict their opening movement. The pin-holes for the reception of the pins are represented as tapered and the pins tapered to correspond, so that the pins may be kept in place by being driven tightly in the said holes. The pin-holes are also represented as formed within grooves provided in the piston for the reception of packing-rings *n*, covering the heads or outer ends of the said pins. To provide for driving out the said pins after the removal of the packing-rings when it is desirable to take out the valves, drift-holes *p* are provided in the ends of the piston, the said drift-holes crossing the pin-holes which receive the pins *m*. These drift-holes *p* are plugged at their outer ends with plugs *q*, (represented as screw-plugs,) so as to prevent any communication being formed between the interior of the piston through the said holes; but when it is intended to remove the pins *m* preparatory to taking out the valves the said plugs *q* are removed to allow a drift to be driven into the said holes through the outer end thereof for the purpose of driving out the said pins *m*.

The operation of this compressor is as follows: During the stroke of the piston in either direction one of the inlet-valves E is opened and the other one is closed and the outlet-valves *d* at one end of the cylinder are closed and those at the other end opened. The air is taken into the cylinder on one side of the piston through the hollow rod or inlet-pipe C, the interior of the piston, and the open valve E, and the air with which the cylinder has been filled on the other side of the piston, at which the valve E is closed, is compressed and forced out through the open outlet-valves *d*. This may be understood by reference to Fig. 1, in which the piston is supposed to be moving to the left. The valve E at the right-hand side of the piston is open and the air is entering the cylinder on that side of the piston, the valves *d* at the right-hand end of the cylinder being at the same time closed, the air being compressed on the left-hand side of the piston, where the valve E is closed, and the air so compressed is being forced out at the left-hand end of the cylinder through the open valves *d* at that end.

The compressor provided with inlet-valves such as are herein described may be worked very rapidly. The said valves, being of considerable weight, are quickly opened and closed by their moment of inertia on the starting of the piston in either direction without waiting for any pressure of air to open them. The hollow piston-rod C, or, in other words, the inlet-pipe attached to and communicating with the interior of the piston, presents a concentrated inlet for taking in cold air from the outside of the building in which the air-compressor is used. Moreover, the dispensing with the inlet-valves in the cylinder-head enables a greater portion of the head to be water-jacketed.

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

1. The combination, in a compressor, with a hollow piston having ports in its opposite faces communicating with the cylinder and a hollow piston-rod or inlet-pipe in free communication with the interior of said piston at its inner end and with the atmosphere or source of supply at the outer end, of valves fitted to said ports in the piston and opening outwardly from said cavity to the cylinder, substantially as and for the purpose herein set forth.

2. The combination, with the cylinder of a compressor and outlet-valves in the opposite heads thereof, of a hollow piston, a hollow rod attached to said piston, passing through one of the cylinder-heads, and open at the outer end to constitute an inlet-pipe, and inlet-valves provided in the piston on opposite sides thereof and opening outward therefrom, substantially as and for the purpose herein described.

3. The combination, with the piston of a compressor constructed with an annular passage and with two valve-seats, one within the inner circumference and the other outside of the outer circumference of said annular passage, of a ring-valve having internal and external flanges which form valve-faces corresponding with said seats, substantially as and for the purpose herein described.

4. The combination, with the piston of a compressor constructed with an annular passage, a cylindrical valve-guide within said passage, and a valve-seat on one face of the piston at one edge of said passage, of a ring-valve fitted to said guide and having a flange which constitutes a valve-face fitted to said seat, substantially as and for the purpose herein set forth.

5. The combination, with the piston of a compressor, of a ring-valve of T-shaped radial section, substantially as herein described, whereby there is formed an annular stem and one face within the inner circumference and another outside of the outer circumference of said stem, as herein set forth.

6. The combination, with the piston of a compressor constructed with an annular passage and a ring-valve adapted to said passage and containing slots, of pins inserted into the piston across the said passages and passing through the said slots in the valve to retain the latter within the piston, substantially as and for the purpose herein set forth.

7. The combination, with the hollow piston

of a compressor constructed with an annular passage, with pin-holes crossing said passage, and with drift-holes crossing said pin-holes, of a ring-valve adapted to said passage and containing slots, pins inserted into said pin-holes and through said slots for securing the valve in place, and plugs inserted into said drift-holes for closing the same, but removable to permit the entrance of a drift for driving out the said pins to liberate the valve, all substantially as herein described.

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