(No Model.)

O. WEGNER.

COMPRESSOR OR PUMP.

No. 575,139. Patented Jan. 12, 1897.

Fig. 1.

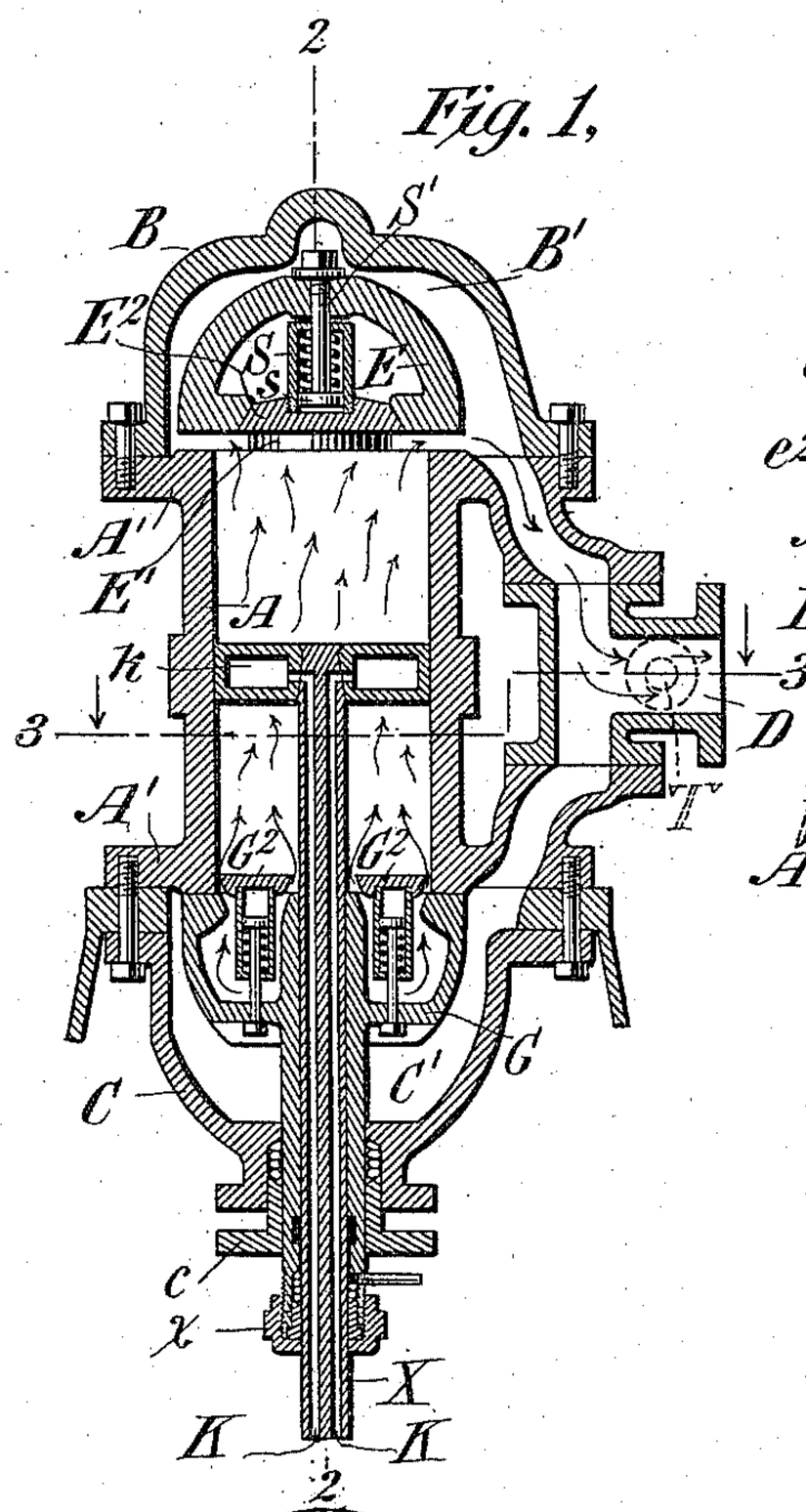


Fig. 2.

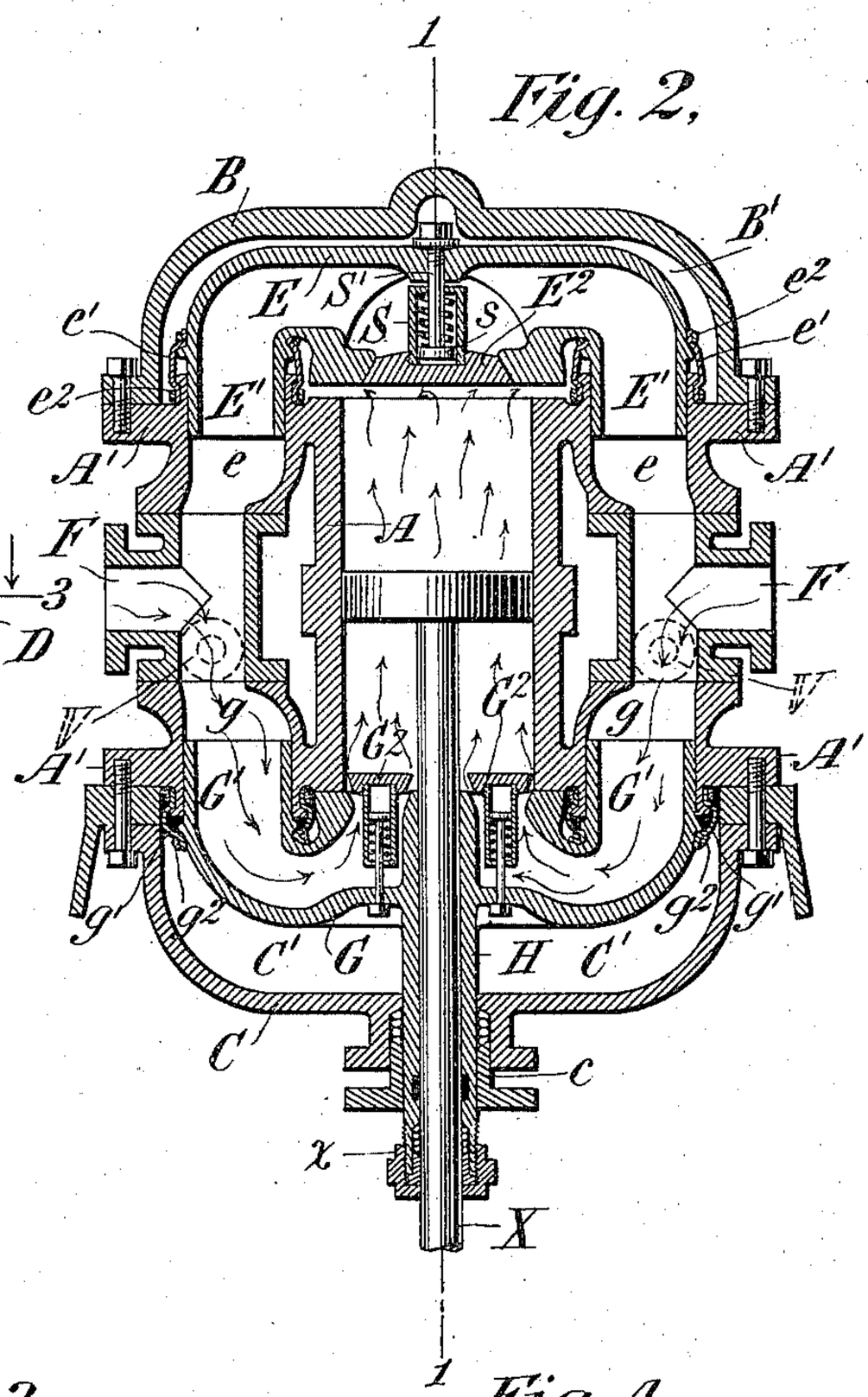


Fig. 3.

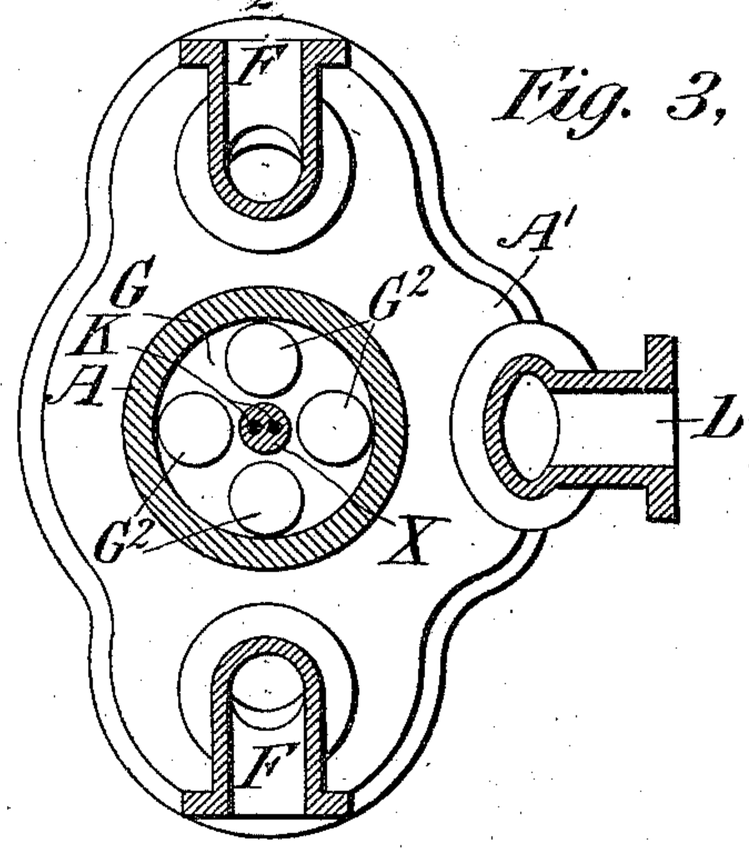
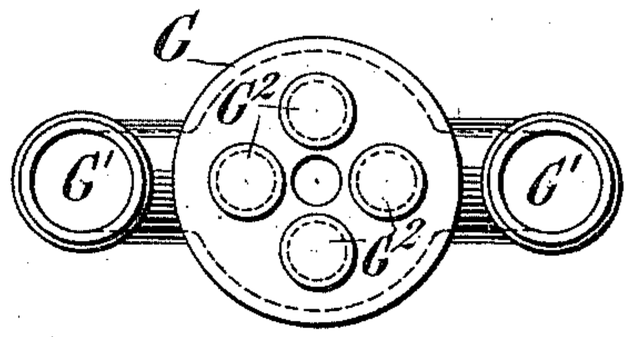


Fig. 4.



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UNITED STATES PATENT OFFICE.

OSCAR WEGNER, OF BROOKLYN, NEW YORK.

COMPRESSOR OR PUMP.

SPECIFICATION forming part of Letters Patent No. 575,139, dated January 12, 1897.

Application filed July 9, 1894. Serial No. 516,975. (No model.)

To all whom it may concern:

Be it known that I, OSCAR WEGNER, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Compressors or Pumps, of which the following is a specification.

The object of my invention is to provide an apparatus of this class in which the contents of the cylinder are completely ejected at each stroke of the piston, the purpose being to increase the capacity beyond that of the ordinary style of apparatus now in general use.

I have shown a double-acting compressor or pump in general organization as follows: At each end of the cylinder is a closed chamber communicating with the eduction-port. In each chamber is a hollow valve, that I call a "head-valve," that seats against the flat face of the cylinder and closes its end. These hollow head-valves have therein induction-valves that open into the cylinder, and tubular projections that work, with an air-tight joint, in induction-passages of the apparatus, there being sufficient play to allow the movement of the head-valve from its seat to discharge the contents of the cylinder as the piston approaches or lifts it in the movement of the piston to or beyond the extreme end of the cylinder. The difference in the respective collective pressure upon the opposite sides of the head-valve returns it to its seat on the flat face of the cylinder as the piston recedes, and when said valve is so seated and on the continued recession of the piston the induction valve or valves therein open and admit the air, gas, or liquid to the rear side of the piston.

In the accompanying drawings, which show my invention in the form now best known to me, Figure 1 is a vertical longitudinal section on the line 1 1 of Fig. 2; Fig. 2, a similar view on the line 2 2 of Fig. 1. Fig. 3 is a transverse section on the line 3 3 of Fig. 1, looking in the direction of the arrows; and Fig. 4 is a plan view of the lower hollow head-valve, having therein four induction-valves surrounding the piston-rod opening, and the induction-passages in the tubular extensions of the head.

I have omitted all parts of the framing or supports which are unnecessary to an understanding of my invention.

The cylinder A is formed or cast with a flange A′ at each end, to which are bolted the end pieces B C, that form chambers B′ C′, that communicate with the eduction port or passage D. Within the chamber B′ is a hollow head-valve E, that seats upon the flat face of the cylinder, and has on opposite sides two tubular extensions or arms E′ E′, that fit closely and work in passages *e e*, that communicate with induction-ports F. The joint between E′ E′ and *e e* may be packed, and I have shown an annular yielding sheath *e′*, closing the joint and attached to the respective parts by clamping rings or wires e^2. An induction-valve E^2 of special construction is seated centrally in the face of the hollow head-valve opposite the end of the cylinder, and when seated, it is flush with the face of the hollow head-valve. When open, it establishes communication between the cylinder and the interior of the head-valve, and thence to the induction port or ports through the telescoping connections E′ *e′*. The other end of the cylinder is provided with a head-valve G of similar construction and arrangement, except it has a central opening for the piston-rod X and a concentric tubular extension H therefrom which passes through a stuffing-box *c* in the end piece C and in which the piston-rod works, a stuffing-box *x* being applied at the end of the extension, and instead of a single induction-valve, as in the other head, it has four such valves G^2 arranged around the piston-rod, the purpose being to provide an area of inlet approximately equal to that of the valve E^2.

G′ *g g′* g^2 show parts corresponding with E′ *e e′* e^2. The area of the induction-valve E^2 and the combined area of the four induction-valves G^2 is preferably, respectively, about equal to one-half the area of the flat face of one side of the piston.

The back pressure of the compressed air, gas, or liquid holds the head-valve upon its seat as the piston moves away from the head-valve, and the induction-valve therein opens to admit the incoming air, &c. After the head-valve has been moved from its seat the action of the piston which passes to or beyond the extreme end of the cylinder expels its entire contents, and as the piston recedes the head-valve follows with it and comes to its

seat. Such action is due to the fact that the area of the head-valve upon which the compressed air, &c., acts to close it against its seat is greater than the area thereof upon which the compressed air acts in the opposite direction. This difference of area is due to the fact that the tubular extensions working in the induction-passages are isolated or occluded from and reduce the area next or adjacent to the end of the cylinder, and such difference of area is amply sufficient to effect the closing of the head-valves by the back pressure. If the surface of contact of the face of the piston and the face of the head-valve were perfectly true and close, the back pressure would be excluded from the area of the head-valve covered by the piston, but I do not rely upon such a condition to obtain the requisite difference in area or pressure. Such difference in area, and consequently difference in pressure, upon the opposing faces of the head-valve as may be required in any particular case may readily be obtained by constructing the tubular extensions connected with the head-valve of different areas.

The area of the tubular extensions G′ at the piston-rod end of the machine is somewhat greater than that of those at the opposite end. This is done to compensate for the area on the face of the head-valve farthest from the cylinder occluded by the tubular hub H.

The machine may be arranged vertically, as shown, or in other positions.

The induction-valves in the head-valves are constructed as follows: Each valve has a tubular stem S, partly closed at the end by an internal annular flange. The fixed pin or bolt S′ upon which the valve-stem works passes through the end of the stem and is provided with a head *s*, fitting the stem, and between such head and the flanged end of the tubular stem is a coiled spring surrounding the pin. This construction insures a proper guiding and seating of the valve.

I represents an oil-pipe for oiling the bearing of the piston-rod.

K K are passages through the piston-rod leading to a chamber *k* therein to provide for a circulation of a cooling agent to reduce temperature. Flexible connections should be attached to the outlets of these passages.

As shown and as thus far described the apparatus is assumed to be placed in a closed circulation system of liquid or gas, as, for instance, the closed circulation system of a refrigerating-machine using ammonia or other gas, wherein the normal back pressure will be sufficient to close the cylinder head-valves against their seats. When used as an ordinary liquid-pump, the back pressure of the column of liquid will be sufficient to accomplish the same end. When used as an air or gas compressor working into a receiver or to an auxiliary chamber connected with the main receiver through a pressure-valve, the requisite initial pressure may be obtained by the use of an auxiliary compressor of ordinary construction.

The operation is as follows: Figs. 1 and 2 show the piston traveling upwardly. The lower head-valve is seated against the end of the cylinder and the induction-valves therein are open, the passage of the gas or liquid through such valves into the cylinder being indicated by the arrows. On the opposite side of the piston the compression has reached a point where the upper head-valve is lifted from its seat on the flat face of the cylinder and the contents of the cylinder are being expelled, as indicated by the arrows. The stroke of the piston carries it slightly beyond the end of the cylinder, so that the cylinder is completely emptied, and on the return stroke the upper head-valve follows in contact with the piston and comes to its seat on the flat face of the cylinder, being forced down by the back pressure, as described. As the piston continues its motion the induction-valve in this head-valve is opened and gas or liquid enters the cylinder. As the piston continues its downward motion the operation described is repeated at the other end of the cylinder, the lower head-valve being lifted against its seat by the back pressure as the piston recedes.

I have indicated by dotted lines at T an ordinary pressure-regulating valve located in the eduction-port D and at V V ordinary closure-valves in the induction-passages. Such valves may be used in starting the machine in the absence of a sufficient initial back pressure, as follows: The valves V V should be closed, and it will be assumed that the piston is in the central position shown in the drawings. As the piston moves upwardly the air, gas, or liquid in front of the piston and in the chamber and eduction-passages will be compressed. On the return movement of the piston the difference of pressure on the opposite sides of the head-valve E may seat it. If not, when the piston has passed beyond the central position a partial vacuum will be created and the induction-valve will open and admit air, gas, or liquid. On the return stroke of the piston a sufficient pressure will be established in the chamber B′ to seat the head-valve as the piston recedes. The valves V V may then be opened and the operation will proceed as already described.

The tubular extensions E′ E′ and G′ G′ are symmetrically located on opposite sides of the head-valves to afford a proper balance and movement.

The apparatus may of course be used as a vacuum-pump.

I claim as my invention—

1. The combination, substantially as set forth, of the cylinder, the piston, the end chamber communicating with the eduction-port, the hollow head-valve arranged in said chamber seated against the end face of the cylinder, the induction-port, extensible con-

nections between such port and the interior of the head-valve arranged on the face of said valve adjacent or next to the cylinder end, and the induction-valve arranged in the head-valve, whereby the area of the face of the head-valve adjacent to the cylinder is made less than the area of the opposite face of such valve and the valve caused to close by the back pressure of the fluid.

2. The combination, substantially as set forth, of the cylinder, the piston, the chamber at each end of the cylinder communicating with the eduction-port, the hollow head-valve in each chamber seated against the end face of the cylinder, the extensible or telescoping connections on the side of the head-valve adjacent to the cylinder between the interior of the head and the induction-port, an induction-valve in said head, and the piston-rod passing through one of said heads and end chambers, whereby the area of the face of the head-valve adjacent to the cylinder is made less than the area of the opposite face of such valve and the valve caused to close by the back pressure of the fluid.

3. The combination, substantially as set forth, of the cylinder and piston, the chambers at the end of the cylinder communicating with the eduction-port, the valved hollow head-valves in said chambers connected by extensible joints on their faces adjacent to the cylinder with the induction-port, a tubular extension from one of said head-valves passing through the wall of the end chamber and through a packing-box, and the piston-rod having its bearing in such tubular extension, whereby the area of the face of the head-valve adjacent to the cylinder is made less than the area of the opposite face of such valve and the valve caused to close by the back pressure of the fluid.

4. The combination, substantially as set forth, with the cylinder, the piston working therein and the end chamber communicating with the eduction-port, of the hollow head-valve in said chamber closing the end of the cylinder, an induction-valve therein, opposite the end of the cylinder, and a yielding or telescoping connection between the induction-port and the interior of said head-valve located in the face of the head-valve adjacent to the end of the cylinder, whereby the area of the face of the head-valve adjacent to the cylinder is made less than the area of the opposite face of such valve and the valve caused to close by the back pressure of the fluid.

5. The combination, substantially as set forth, with the cylinder, the piston working therein and the end chamber communicating with the eduction-port, of the hollow valved head-valve in said chamber seating against the flat face of the cylinder and having one or more tubular extensions on its face next to the cylinder working in an induction passage or passages, for the purpose described.

6. In an apparatus of the character described, the combination of the cylinder and the piston moving to or beyond the extreme end of the cylinder, the head-valve closing the end of the cylinder and the induction and eduction passages, the head-valve having its two areas upon which the back pressure acts with a tendency to move it toward and from the cylinder so related that the area of the face adjacent to the cylinder is less than that of the opposite face, whereby the difference in pressure upon the two faces of the valve causes it to be seated after it has been displaced by the action of the piston and as the piston recedes.

7. A valve having opposite faces or areas upon which the same medium of pressure acts, and part of the area of the face adjacent to the valve-seat isolated from such pressure and exposed to a less pressure, whereby the valve is caused to close against its seat by the difference in pressure upon said two faces.

8. A valve having a portion of its side adjacent to its seat isolated and exposed to a less pressure than that exerted upon the remainder of the valve, whereby the valve is caused to close by the preponderance of pressure exerted upon that side of the valve farthest from its seat, substantially as set forth.

In testimony whereof I have hereunto subscribed my name.

OSCAR WEGNER.

Witnesses:
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EDWARD C. DAVIDSON.