(No Model.)

C. GRAEFE.

AIR PUMP.

No. 565,893. Patented Aug. 18, 1896.

Fig. 1

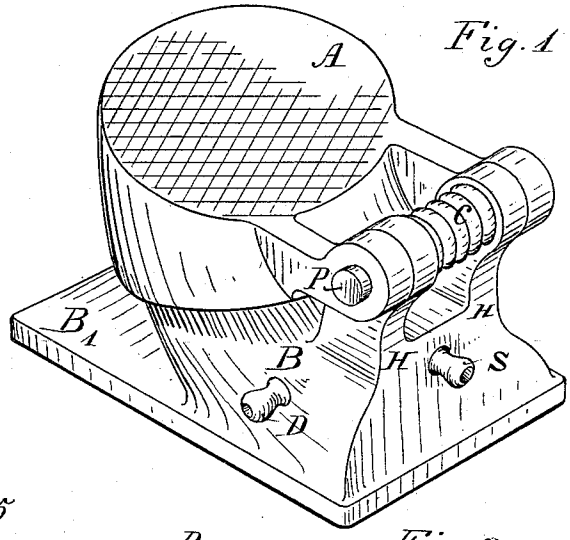


Fig. 5

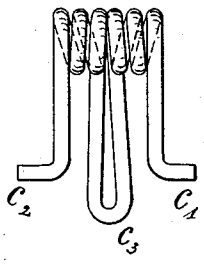


Fig. 2

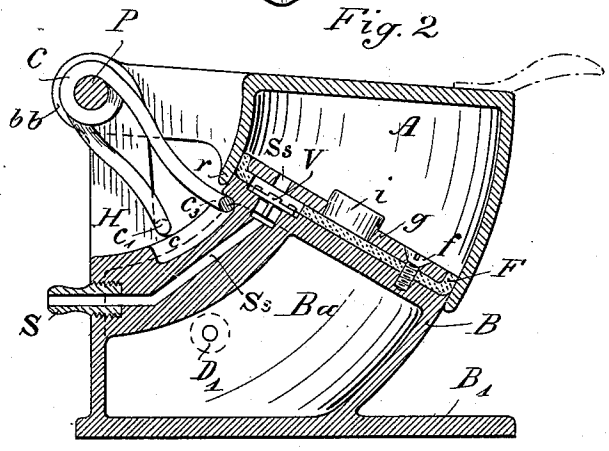


Fig. 6

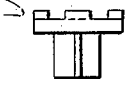


Fig. 7

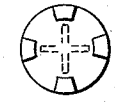


Fig. 3

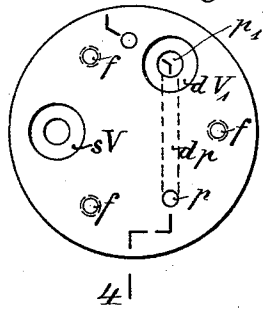
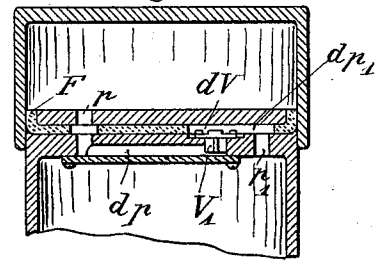


Fig. 4



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UNITED STATES PATENT OFFICE.

CHARLES GRAEFE, OF SANDUSKY, OHIO.

AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 565,893, dated August 18, 1896.

Application filed June 13, 1895. Serial No. 552,690. (No model.)

To all whom it may concern:

Be it known that I, CHARLES GRAEFE, a citizen of the United States, and a resident of Sandusky, county of Erie, and State of Ohio, have invented certain new and useful Improvements in Air-Pumps, of which the following is a full, clear, and exact specification.

My invention relates to pumping-machines; and it consists of a reciprocating air-pump for medical and other purposes, having a stationary piston with automatic suction and discharge valves, an oscillating cylinder hinged to the piston, a spiral spring reciprocating the motion of the cylinder, and several minor improvements in details of construction.

In the accompanying drawings, Figure 1 is a perspective view of the pump; Fig. 2, a longitudinal section showing details of construction; Fig. 3, a top view of the piston; Fig. 4, a section on line 4 4 in Fig. 3. Fig. 5 is a front view of the reciprocating spring effecting the return motion; Fig. 6, a side view, and Fig. 7 a top view, of the valves.

Similar letters of reference indicate corresponding parts in all views of the drawings.

Stationary piston B is circular in section and curved to form a segment, having its center in pivot P, and is cast in one piece with base B′ and columns H, supporting pivot P in bearings *bb*. Piston B is hollow, its inner space B*a* being utilized as an air-reservoir, to produce and maintain a constant pressure for the flow of air.

In top of piston B is seated the suction-valve V in seat *s*V, discharge-ports *p* and *p′*, passages *dp* and *dp′*, and between these the discharge-valve *d*V. Passage *dp* is cut clearly through the top of piston B and hermetically closed from below by plate g_1, screwed to the top. Piston B is covered with a soft-rubber or leather packing F, having appropriate openings for the ports and valve-seats, and having its edge turned upward around plate *g*, secured to the piston by screws *f*, sunken in plate *g* and passing through packing F into the top of piston B. In the center of plate *g* a hollow rubber buffer *i* is set. This buffer has the function to give the cylinder A an impetus for its return motion when its top abuts against it, thus supplementing the action of the reciprocating spring C.

Suction-port S*s* extends through the back of cylinder B outward. Hollow stud S, terminating the port, may either be provided with a screw-thread for a coupling, or adapted for the attachment of a rubber pipe. Thus the suction-port S*s* may be connected to an air-filter or to some apparatus for saturating air with oxygen and the like or to apparatus producing gaseous medicaments used in medical treatment of diseases, fumigation, and the like.

Discharge-port *p* (shown in Fig. 3) opens into passage *dp*, communicating through pressure-valve V'_1 with passage *dp′*, opening into port *p′*, through which the air, filling cylinder A, is pressed into reservoir B*a* in the hollow piston B and escapes through stud D′, adapted to be connected either by a coupling or a rubber pipe to a nozzle or to an apparatus, as may be required.

Both the suction-valve V and the pressure-valve V′ are alike in construction, closing automatically the respective ports by their force of gravity, and being lifted by suction or pressure, respectively.

Cylinder A is corresponding in shape and snugly fitted upon piston B, and hinged to it, oscillating on pivot P. Reciprocating spring C (shown in Fig. 5) is slid on pivot P and so arranged that its hooked ends C′ and C^2 rest against columns H, and loop C^3, moving in groove *c* on back of cylinder B, presses against edge *r* of the cylinder. During the downward movement of the cylinder B the air contained in it is pressed through port *p*, passage *dp*, and, lifting pressure-valve V′, passes into passage *dp* and through port *p′* into reservoir B*a*. Suction-valve V is held closed by the pressure. In working the pump, cylinder A is moved downward until the top of the cylinder abuts against buffer *i*, whereupon the motion is stopped and reversed. During this return movement of the cylinder A pressure-valve V_1 is held closed and suction-valve V opened, drawing in new air through passage S*s*. The movement of spring C, and consequently also of cylinder A, is arrested when loop C^3 reaches the top of groove *c*, thus averting the slipping off of the cylinder of the piston.

The pump may be worked either by hand

or by power, and the cylinder is then appropriately equipped with a handle or with some other contrivance for moving it intermittingly downward. In Fig. 3 I have shown in dotted lines a handle for working the pump by hand. In Fig. 1 I have shown the outer surface of the cylinder roughed. This roughing is done on pumps designed to be driven by foot-power, as it may be necessary in many cases where the pump is used in combination with some medical apparatus. I shall not describe such devices in detail, as I do not intend to claim any special method of working the pump, the object of my invention being the pump itself, as shown in the drawings and described in the specification, this construction being capable of being worked either by hand or by foot, or by any other power, and for every use wherever such pumps may be employed.

Having thus fully and clearly described my improved reciprocating air-pump, I claim as my invention and desire to secure by Letters Patent—

1. A reciprocating air-pump, comprising a stationary curved piston, with induction and eduction ports, automatic suction and discharge valves, and an elastic buffer, a pivoted cylinder, corresponding in shape to the piston, and a spring, effecting the return motion of the cylinder at the end of each stroke.

2. In a reciprocating air-pump, the combination with a stationary curved piston, having induction and eduction ports, provided with automatic suction and discharge valves, of an air-reservoir, interposed in the piston between the discharge-valve and the eduction-port, receiving the air discharged under pressure from the cylinder, whereby the outflow of the air from the pump is steadied.

3. In a reciprocating air-pump, the combination with a curved piston, having induction and eduction ports with automatic suction and discharge valves, and a cylinder, pivoted to the piston, of a spring, set on said pivot between the piston and the cylinder, resisting the inward and effecting the return motion of the cylinder at the end of each stroke, and having a loop, moving in a groove, limiting the motion of the spring.

In witness that I claim this as my invention I have signed this specification in the presence of two subscribing witnesses.

CHARLES GRAEFE.

Witnesses:
D. WALDKIRSHER,
GEORGE ALLGOOD.