(No Model.) 2 Sheets—Sheet 1.

A. G. NOACK.

HYDRAULIC AIR PUMP.

No. 575,614. Patented Jan. 19, 1897.

Fig. 1.

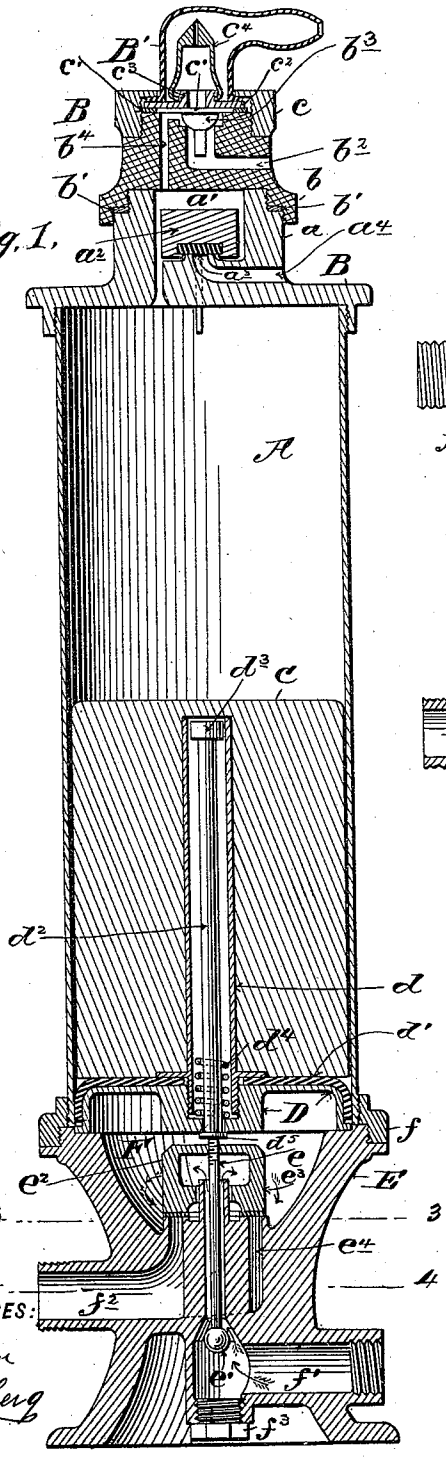

Fig. 3.

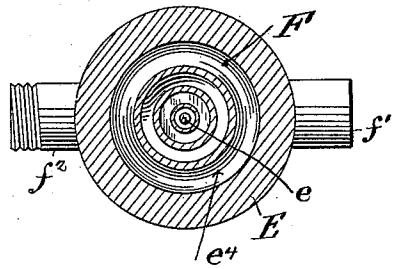

Fig. 4.

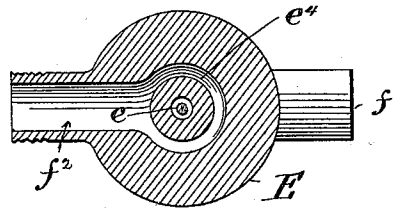

Fig. 5.

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Fig. 2.

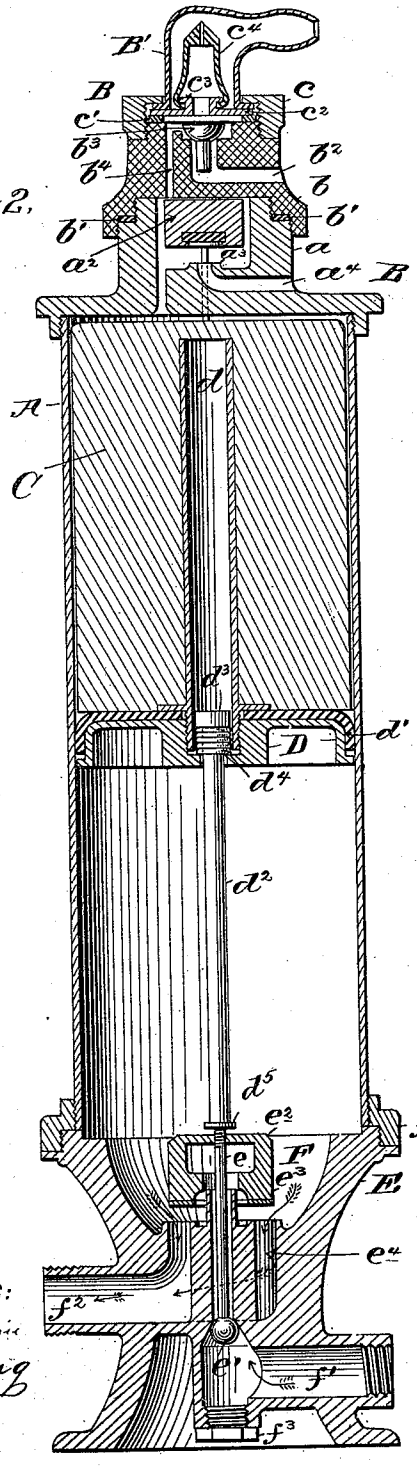


Fig. 7.

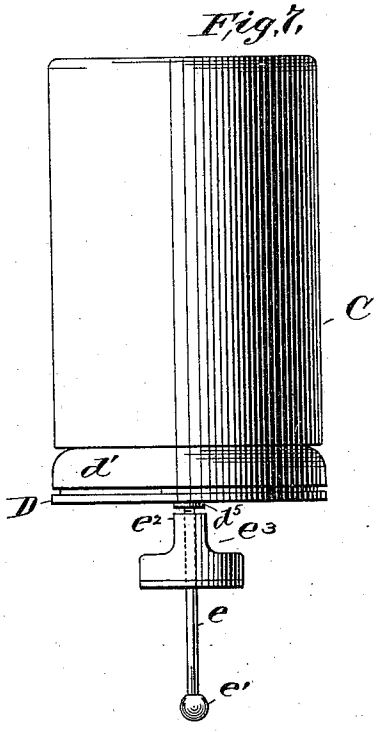
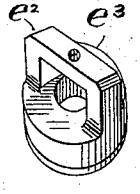


Fig. 6.



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UNITED STATES PATENT OFFICE.

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HYDRAULIC AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 575,614, dated January 19, 1897.

Application filed October 30, 1895. Serial No. 567,439. (No model.)

To all whom it may concern:

Be it known that I, ADOLPH G. NOACK, a citizen of the United States, and a resident of the city of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Hydraulic Air-Pumps, of which the following is such a full, clear, concise, and exact description as will enable others skilled in the art to which my invention appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to that class of air-pumps in which water-pressure is utilized for operating the piston. In such pumps it is usually necessary to have a nice adjustment and regulation of the parts. The inlet-valve must be so constructed and arranged as to admit the water at the proper time to give the piston its forward or compression stroke, at the end of which this valve must be closed, the water-outlet valve opened, and the water discharged from the cylinder during the return or back stroke.

The objects of my invention are to construct a hydraulic air-pump in such a manner as to simplify the valve mechanism and water connections and to insure efficiency; and it consists in the construction and arrangement of parts, all as hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical central section of my improved air-pump, showing the sliding piston or traveler in its lowest position within the cylinder and with the water-inlet valve open to admit the water for actuating the piston. Fig. 2 is a similar section, but showing the piston in its highest position or at the end of its compression-stroke and showing also the air-relief valve open, the water-inlet valve closed, and the water-outlet valve open or lifted from its seat for permitting the water to flow out during the return of the piston to its former or normal position. Fig. 3 is a horizontal section taken on the line 3 3 of Fig. 1, giving a plan view of the seat for the water-outlet valve and of the surrounding port through which the water flows to the discharge-outlet, and in this figure the stem of the water-inlet valve is shown in section. Fig. 4 is a horizontal section taken on the line 4 4 of Fig. 1, showing the water-outlet port at a lower point than in Fig. 3, the discharge-outlet appearing in section, as does also the stem of the water-inlet valve. Fig. 5 is a detached perspective view of the air-relief valve, which is operated by the piston near the end of its compression-stroke when it becomes necessary to open the water-outlet valve. Fig. 6 is a detached perspective view of the water-outlet valve, showing its form and the yoke by which it is connected to the stem of the water-inlet valve and to a rod by which both valves are lifted, so that the inlet-valve is brought to its seat and the outlet-valve away from its seat. Fig. 7 is a separate or detached view of the piston or traveler, which is moved within the cylinder and shows in connection therewith the water-inlet and the water-outlet valves.

In the drawings, A represents the pump-cylinder, which may be of glass, metal, or any other suitable substance. This cylinder is covered at the top by a head B, which for convenience of manufacture is preferably formed in sections or parts *a b c*, one above the other, with a dome B′ at the top, as shown. The section *a* is secured over the top of the cylinder A and is provided with a chamber *a′*, which communicates with the interior of the cylinder. The chamber *a′* contains an air-relief valve a^2, the form of which is best shown by Fig. 5, and this relief-valve rests upon a seat a^3, so as to cover a port a^4, which when open makes communication between the chamber *a′* and the atmosphere.

A gasket or packing-ring *b′* is preferably interposed at the juncture of the sections *a* and *b*, in order to insure an air-tight joint. The section *b* is provided with an air-inlet port b^2, closed at its inner end by a light valve b^3, preferably of rubber, and this valve when drawn or lifted from its seat permits free ingress of the air, which passes through a communication b^4 to the chamber *a′* and from thence to the interior of the cylinder. A gasket *c′* is shown as being placed on the top of the section *b*, over which there is a diaphragm c^2, having a collar c^3 with a central opening for permitting the compressed air to pass into

a slitted rubber discharge-valve c^4, which is secured over the collar c^3. The flanged base of the dome B′ rests on the diaphragm c^2 and is secured along with it and the air-discharge valve by the section c, screwed to the top part of the section b, as shown. The dome B′ is provided with an outlet to be connected with a tube or pipe leading to a reservoir (not shown) for receiving the air when compressed.

A weight C, preferably molded of lead, which also acts as the piston or traveler, is placed within the cylinder A and has its lower end secured to a base or bottom piece D by a screw-threaded projecting tube or pipe d, around which the lead is molded and thus secured thereto. A packing d' is interposed between the weight C and its base D, in order to close the clearance and make a water-tight joint between the piston and the cylinder. The tube d also extends upwardly within the weight nearly to the top and contains a rod d^2 with a head or flange d^3 at its top. This rod is surrounded by a spring d^4, which seats on the base or bottom piece D, as shown in Figs. 1 and 2, and operates when the relief-valve a^2 is open to lift the rod d^2, connected with the water inlet and outlet valves, so as to open the former and close the latter, as hereinafter explained.

The rod d^3 passes through the base of the piston and may be provided with a nut or flange d^5 to receive the screw-threaded end of a stem e for the water-inlet valve e' after such stem has been secured, as by screwing to the yoke e^2 of the water-outlet valve e^3, which seats over an outlet-port e^4, made in the base-casting E of the cylinder A. This base-casting, as shown, is secured to the cylinder by a screw-threaded collar f, and it is provided with a water-inlet port f', communicating with some source from which the water can be supplied under pressure.

A chamber F is formed in the base-casting beneath the bottom piece of the piston, and the inlet-port f' communicates with this chamber by a passage around the stem of the water-inlet valve. The discharge-valve e^3 being located within this chamber over the port e^4 prevents the water from passing out of it until lifted from its seat, when the water will be free to emerge through an outlet pipe or passage f^2, from which it is discharged or led away. The valve e', with its stem e, is inserted through an opening in the bottom of the casting E, and when secured the opening is closed by a nut f^3, as shown in Figs. 1 and 2.

Viewing the compressor with its parts in the position shown in Fig. 1, it will be observed that the piston or traveler C is in its lowest position within the cylinder A, and that assuming the connections to be made for operating the compressor the cylinder above the piston will be filled with air, the air-inlet valve b^3 and the air-outlet or discharge valve c^4 will both be closed, while the relief-valve a^2 will be resting on its seat, as shown. In such case the water-inlet valve e' will be open and the water-discharge or outlet valve e^3 will be resting on its seat over the water-outlet port e^4, as shown.

The operation of the pump begins by the inflow of water through the port f' in the direction indicated by the arrows. The water rises in the chamber F until it reaches the bottom D of the piston C, when it will raise the piston and force it up within the cylinder, compressing the air in the space above it. As the air begins to compress it will act against the air-inlet valve b^3, forcing it tightly to its seat, and finding no escape will pass within the air-discharge valve c^4 and open the slit, through which it can pass into the dome B′ and to the reservoir. While the piston is moving upward the air also acts against the top surface of the relief-valve a^2, so as to force it more tightly against its seat.

During the upward movement of the piston the rod d^3 remains stationary until the spring d^4 contracts by reason of its meeting the upper head or flange of the rod d^3, and the tendency will be to lift the water-outlet valve e^3, but as the lower portion of the cylinder is at this time filled with water under pressure the spring d^4 will contract to its limit without either closing the inlet-valve e' or opening the outlet-valve e^3. When this point is reached, the weight C strikes the projections of the air-relief valve a^2, which lifts it from its seat, and the escape of air from the chamber a' permits the piston to move rapidly up to the top of the cylinder, while at the same time the spring d^4 expands and lifts the rod d^2, so as to close the water-inlet valve e' and open the water-outlet valve e^3. When the air-relief valve a^2 is opened to permit the air to escape from the chamber a', the back pressure of the air in the dome B′ will act to close the slit in the air-discharge valve c^4 and prevent return of the air already compressed.

The water-outlet valve e^3 being open and the water-outlet valve e' being closed, the act of compression ceases and the water recedes from the cylinder and passes off through outlet f^2. The piston C moves down within the cylinder A, creating a suction which acts to lift the air-inlet valve b^3 and open the air-inlet port b^2, by which means the air-space within the cylinder is filled. The pressure of the water upon the water-inlet valve e' keeps it closed and holds the stem e, together with the rod d^3, up until the base D of the weight C reaches the flange d^5 on such rod, which is thereby depressed and carries the water-outlet valve e^3 to its seat, at the same time opening the water-inlet valve e', when the piston will again be moved up and compress the air, as before, and the operation can be repeated over and over until the water-pressure is shut off.

It is obvious that variations in the way of modifications not shown and in details not specifically pointed out may be made with-

out departing from either the spirit or substance of my invention, and I do not therefore confine myself to the exact forms and arrangements shown and described.

Having thus described my invention, what I claim as new, and for which I desire hereby to secure Letters Patent, is—

1. In a hydraulic air-compressor, the combination of a chamber having air inlet and outlet valve mechanism, a traveler actuated by the water within such chamber, a water-inlet channel, a water-outlet channel, a valve-stem connected to said traveler and passing through said water-inlet channel, a water-inlet valve and a water-outlet valve respectively connected to different points of such valve-stem, substantially as set forth.

2. In a hydraulic air-compressor, the combination of a chamber having air inlet and outlet valve mechanism, a traveler actuated by the water within such chamber, a water-inlet channel, a water-outlet channel, a valve-stem connected to said traveler and passing through said water-inlet channel, such stem carrying a water-inlet valve that seats against the water-entrance end of said water-inlet channel, and also carrying a water-outlet valve attached thereto adjacent to the discharge end of said water-inlet channel, substantially as set forth.

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Witnesses:
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EMIL BOSLEDST.