(No Model.)

A. G. NOACK.

HYDRAULIC AIR PUMP.

No. 580,421. Patented Apr. 13, 1897.

Fig. 1.

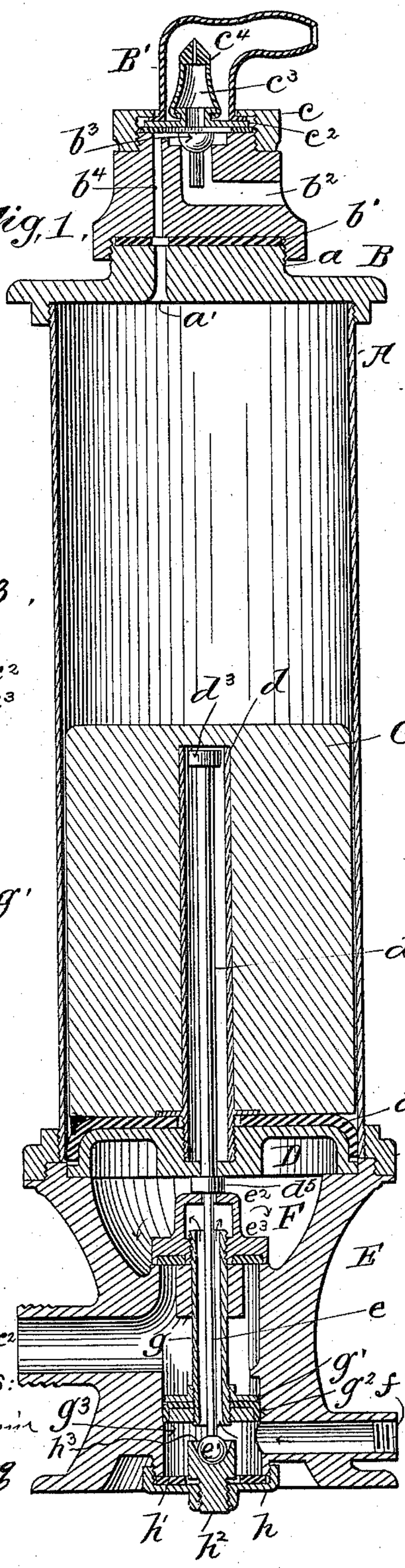


Fig. 3.

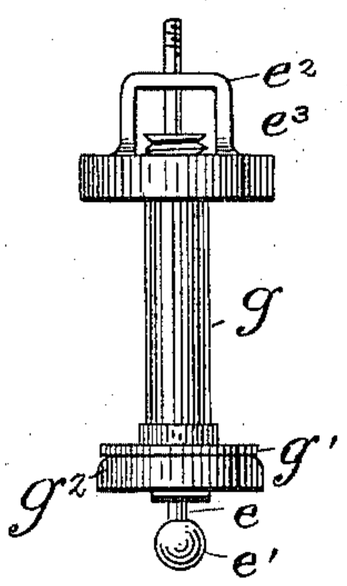
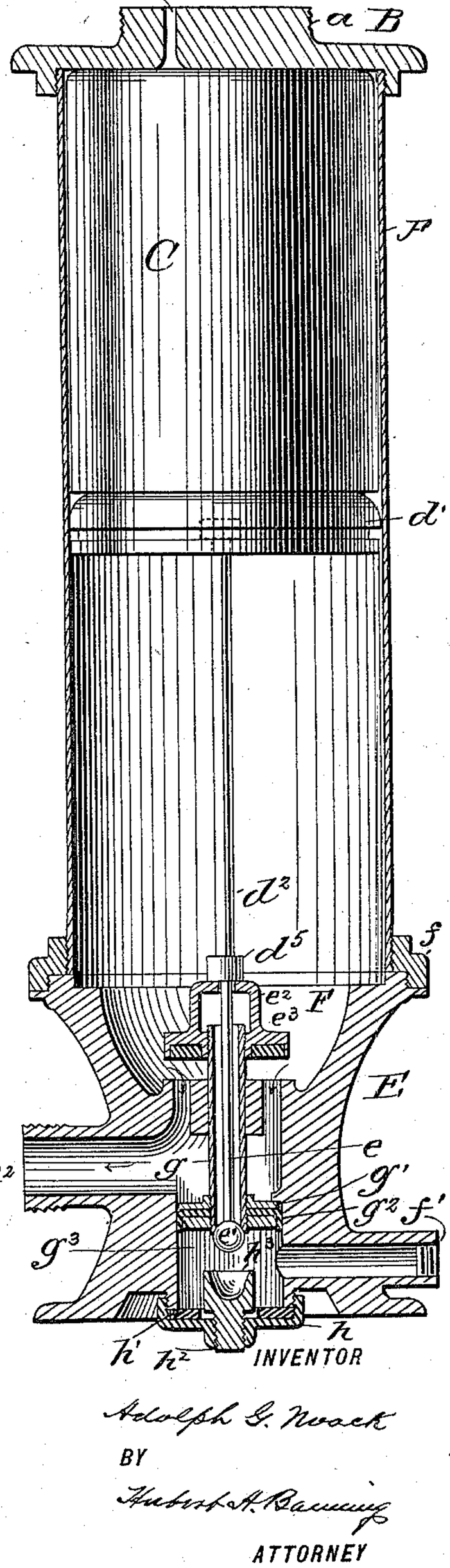


Fig. 2.



WITNESSES:

C. W. Benjamin

Chas. Oberg

INVENTOR

Adolph G. Noack

BY

Hubert A. Banning

ATTORNEY

UNITED STATES PATENT OFFICE.

ADOLPH G. NOACK, OF BROOKLYN, NEW YORK, ASSIGNOR TO THE BERNER-MAYER COMPANY, OF OHIO.

HYDRAULIC AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 580,421, dated April 13, 1897.

Application filed October 30, 1895. Serial No. 567,440. (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 sectional representation of an air-compressor embodying my invention and in which the air-compressing piston is shown in its lowest position, the water-inlet valve open, and the water-outlet valve closed. Fig. 2 is a similar sectional representation, omitting some of the parts at the top and showing the air-compressing piston in its highest position, the water-inlet valve closed, and the water-outlet valve open. Fig. 3 is a view of the water inlet and outlet valves and connecting-tube with a small piston, which parts are also shown in the other figures.

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 port *a′*, which communicates with the interior of the cylinder.

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 port *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 piston or traveler C 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 piston 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 piston nearly to the top and contains a rod d^2, with a head or flange d^3 at its top.

The rod d^2 passes through the base of the piston C and is provided with a nut or flange d^5, which receives the screw-threaded end of the stem *e* of the water-inlet valve *e′*, which passes loosely through the yoke *e* of the water-outlet valve e^3, which seats over an outlet-port e^4, made in the base-casting of the cylinder A. This base-casting is secured to the cylinder by a screw-threaded collar *f*, and it is provided with a water-inlet port *f′*, communicat-

ing 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 C, and the inlet-port f' communicates with this chamber by a passage through a tube or sleeve g, to the top of which the water-outlet valve e^3 is secured. This water-outlet valve being located within the chamber F over the port e^4 prevents the water from passing out of the cylinder until the valve is 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 inlet-valve stem e is made to pass loosely through the yoke e^2 of the water-outlet valve e^3 and connect with the flange or nut d^5 on the rod d^2, as shown. The water-outlet valve e^3 is screwed on the upper portion of the tube or sleeve g, on the lower portion of which the small water-piston g' is screwed on and provided with a packing g^2. The water-outlet valve is thus secured in vertical adjustment on the longitudinally-movable water-inlet channel, and the water-piston is likewise secured in vertical adjustment on said channel, both such water-outlet valve and such water-piston being carried with the longitudinally-movable water-inlet channel in all its longitudinal movement. The piston g' operates for a short distance along the wall of an aperture g^3, made in the casting E between the water-inlet port f' and the water-outlet port e^4. The walled aperture g^3 extends down to the bottom of the casting E, so as to make an opening through which the water inlet and outlet valves, with their connections, may be inserted and secured. This aperture is closed by a cap h and packing h', while on the inside of the cap h there is a projection or piece h^2, having in its upper surface a recess h^3, which forms a seat for the water-inlet valve e' to support the stem e and rod d^2 when the valve is open and the piston C is operating.

Viewing the compressor with its parts in the position shown in Fig. 1, it will be observed that the piston 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. 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 operating 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.

When the piston C is nearing the end of its up or compression stroke, the flange or head d^3 on the rod d^2 will come against the bottom of the tube d and pull the stem e of the water-inlet valve e' against its seat at the lower end of the sleeve g, and thereby close the water-inlet port. When this port is closed, the pressure of the water in the aperture g^3 will cause the piston g' to rise and carry with it the tube or sleeve g, thereby lifting the water-outlet valve from its seat. The water-outlet port e^4 being thus opened, the cylinder A will soon be emptied, and during the outflow of the water the small piston g' will be kept up by the pressure of the water from below, which will also keep the water-inlet valve closed until the piston C has descended far enough to come against the top of the rod d^2 or its head d^3. When this point is reached, the weight of the piston C will depress the rod d^2 and with it the stem e and water-inlet valve e'. During this period the nut or flange d^5 will come against the top of the yoke e^2 of the water-outlet valve e^3 and carry this valve, its sleeve g, and small piston g' down to their former position, so that the water-outlet valve is closed and the water-inlet valve opened by the time the piston C has reached its lowest point. The chamber F will then fill with water as before, and the operation of the pump will be continued as long as water under pressure is admitted through the inlet-port.

It is obvious that changes in detail of construction may be made without departing either from the spirit or substance of my invention.

Having thus described my invention, what I claim as new, and desire to secure by 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 longitudinally-movable water-inlet channel having a water-piston connected thereto so as to be carried with it in all its longitudinal movement, a water-outlet channel, a valve-stem connected to said traveler and passing through said water-inlet channel, a water-outlet valve connected to said water-inlet channel so as to be carried with it in all its longitudinal movement, a water-inlet valve which seats against the water-entrance end of said water-inlet channel and is connected to said 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 longitudinally-movable water-inlet channel having a water-piston secured in vertical adjustment on its lower portion, a water-outlet channel, a valve-stem connected to said traveler and passing through said water-inlet channel, a water-outlet valve secured in vertical adjust-

ment on the upper portion of said water-inlet channel, a water-inlet valve which seats upwardly against the water-entrance end of said water-inlet channel and is secured to said valve-stem adjacent to said water-piston, substantially as set forth.

3. 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 longitudinally-movable water-inlet channel having a water-piston at its lower end, a water-outlet channel, a valve-stem connected to said traveler and passing through said water-inlet channel, a water-outlet valve secured to said water-inlet channel and movable therewith in all the latter's movement, a single water-inlet valve formed independent of said water-inlet channel and seating upwardly against the water-entrance end of such channel, said water-inlet valve solely controlling the admission of pressure-water into said water-inlet channel, said valve-stem having its lower end secured to said water-inlet valve, and solely actuating the latter in its opening movement down from its said seat, substantially as set forth.

ADOLPH G. NOACK.

Witnesses:
ANTHONY M. JOCKEL,
EMIL BOSLEOW.