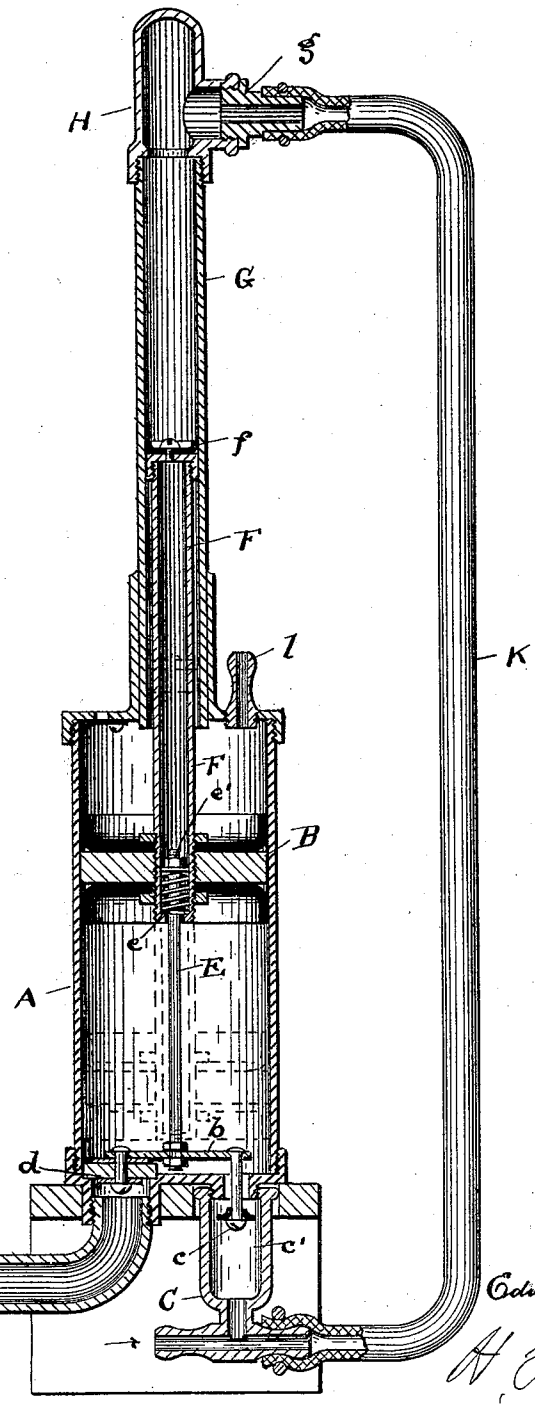
(No Model.)

E. H. WEATHERHEAD.

HYDRAULIC AIR PUMP.

No. 520,466. Patented May 29, 1894.



ATTEST.
R. B. Moser
Nellie L. McLaud

INVENTOR
Edward H. Weatherhead
by
H. J. Fisher
ATTORNEY

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EDWARD H. WEATHERHEAD, OF CLEVELAND, OHIO, ASSIGNOR TO THE CLEVELAND FAUCET COMPANY, OF SAME PLACE.

HYDRAULIC AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 520,466, dated May 29, 1894.

Application filed June 17, 1892. Serial No. 437,056. (No model.)

To all whom it may concern:

Be it known that I, EDWARD H. WEATHERHEAD, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Hydraulic Air-Pumps; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to hydraulic air pumps, and belongs to the type of pump described and claimed in my application filed July 23, 1890, Serial No. 359,667, and the invention consists in specific improvements, substantially as shown and described and particularly pointed out in the claims.

The accompanying drawing shows a central vertical sectional elevation of my improved form of pump.

The present form of pump is distinguished from others in this line by the location of the air and water chambers intermediate of the valve chamber and valves for controlling the inlet and outlet of the water and the piston chamber with the hydraulic returning piston. A further distinguishing feature is the water passage leading from the valve chamber to the hydraulic returning chamber, located and arranged external to the other chambers.

A represents the main casing or cylinder closed about its sides and open at its ends, for connections as shown. The piston or diaphragm B, is located in this cylinder and subdivides the said cylinder into a water chamber beneath said piston, and an air chamber above the said piston. At the bottom of the said main casing or cylinder A is a water inlet coupling, C, and the water outlet, elbow, or pipe D, both of said parts being seated immediately in the bottom of the said cylinder A and opening into the same through the bottom thereof; an inlet valve *c* is arranged in the valve chamber *c'* of the said coupling and adapted to seat against the bottom of the said main casing to close the water passage in and through the same, and a valve *d* controls the outlet passage through the elbow or pipe D. The valve *c* is located on the outside of, or beneath, the bottom of the main casing, and the valve *d* is located inside or above the said bottom of the main casing, and the two valves are connected by a cross piece *b* to which they are respectively rigidly affixed, and which cross piece is fixed to the valve stem E. The said valves have a joint operation, and reciprocate within the said main casing within certain narrow limits which are designed to be just sufficient to give a free flow of the water through either the inlet or the outlet opening, as the case may be, when one or the other of said valves is open for this purpose. In the position of the valves as shown in the drawing, the inlet valve *c* is open, and the outlet valve *d* is closed. Assuming that the piston B is rising under the pressure of water flowing into the water chamber beneath the same, with the valve *c* open as shown, the said valve will be closed against the bottom of the said main casing when the piston B has risen far enough above its present position to cover the distance between the head of the said valve and its seat on the bottom of said casing. When this occurs the water must cease to flow inward, and the said piston B can travel no higher. At the same time that the said valve *c* is thus closed, the valve *d* is open, and the water in the main casing is permitted to escape, and does escape until the said piston B drops to the position shown in dotted lines. In its descent the said piston strikes against the cross piece *b* or the nut securing the same at the top, and carries the valves *c*, *d*, down with it, so that thereby the valve *c* is again opened and the valve *d* closed. When the valves are raised so that the valve *c* is closed and the piston B is descending, the water pressure in the valve chamber *c'* bearing against the bottom of the valve *c* serves to hold said valves in raised position and to keep the valve *c* closed. The said valves remain in this position until the piston B reverses them, as just above described.

The valve stem or rod E extends into the tube or pipe F which projects through the center of the piston B, and a slight distance beneath the same. A spiral or coiled spring *e*, is placed in the said tube or pipe F between its lower extremity, and the head *e'* of the rod E, so that there is a spring or cushioned effect on the said valve stem or rod E when the same is carried upward by the piston B,

as occurs when the valve *c* is closed and the valve *d* open to reverse the action of the pump. Extending upward from the top of the main casing is a tube or cylinder G which is rigidly affixed to the said main casing and into which the tube or pipe F projects. This tube or pipe F has a piston *f* at its upper end which is packed water tight in the cylinder or tube G so that so far as the said piston *f* is concerned, the tube or pipe F serves as a means of operating the same, and performs the function of an ordinary piston rod. The tube or pipe F is closed at its top by the said piston *f*, and is open at its bottom about the rod E, which works through the same, so that a water passage is formed about said rod E through the said tube or pipe F into the same and thus the same water pressure is maintained in the said tube or pipe bearing against the bottom side of the said piston *f*, as exists in the water chamber beneath the piston B. The piston B is packed so as to be water tight, and is so located and operated that it forms a diaphragm or division between the water chamber beneath the piston and the air chamber above the piston.

The coupling C has a T head with a passage in the stem thereof entering the valve chamber in said coupling, and a through passage for the water, and is connected by any suitable means with a source of supply. A cap H is shown here as surmounting the piston cylinder G and forming a continuation of the same, and a coupling *g* connects with the side of this cap. Between the coupling C and the coupling *g*, outside of the pump mechanism, is a flexible tube or pipe K, which is connected at its ends with said couplings and forms a water passage leading from the said coupling C to the said coupling *g*, and serves to convey water pressure to the piston or chamber in the cylinder G above the piston *f*. The water pressure above the returning piston *f* is therefore always maintained at the normal pressure of the water supply, and this pressure above the returning piston being constantly on, serves to assist in returning the main piston down to a starting position when the water from the chamber beneath the said main piston is exhausting. It will be seen that when this occurs there is no pressure behind the said piston B but such as is exerted in the cylinder G above and upon the piston *f*. But this is sufficient to carry the said piston B down and to restore all the parts to their starting position. The pressure behind or above the piston *f* is practically counter-balanced by the pressure beneath the same within the tube F, so that when the valve *c* is opened, and the air is compressed in the chamber above piston B, there is nothing to resist the upward movement of the said piston B except the back pressure of the atmosphere in the air chamber. From this chamber the air is forced through the nozzle *l* and conveyed wherever desired.

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

1. A hydraulic air pump provided with air and water chambers and a piston separating said chambers, a hydraulic returning piston and chamber above said air and water chambers, and a valve chamber beneath the same, and an external water passage connecting said valve chamber and said returning piston chamber, substantially as described.

2. In a hydraulic air pump, the main casing having water passages at one end and air passages at the other end, and a main piston in said casing separating the air and water therein, a water inlet valve chamber at the bottom of said casing, a piston chamber and a hydraulic returning piston at the top of said casing, and a water passage external to the main casing communicating with the said valve chamber and the said hydraulic returning piston chamber, substantially as described.

3. The main casing having water inlets and outlets at its bottom and air inlets and outlets at its top, and a main piston in said casing, in combination with a piston chamber opening into said main casing and a returning piston in said chamber having a tubular stem connected with the main piston and open to the fluid beneath the said main piston, substantially as described.

Witness my hand to the foregoing specification.

EDWARD H. WEATHERHEAD.

Witnesses:
H. T. FISHER,
NELLIE L. MCLANE.