(No Model.)

E. H. WEATHERHEAD.

HYDRAULIC AIR PUMP.

No. 562,163. Patented June 16, 1896.

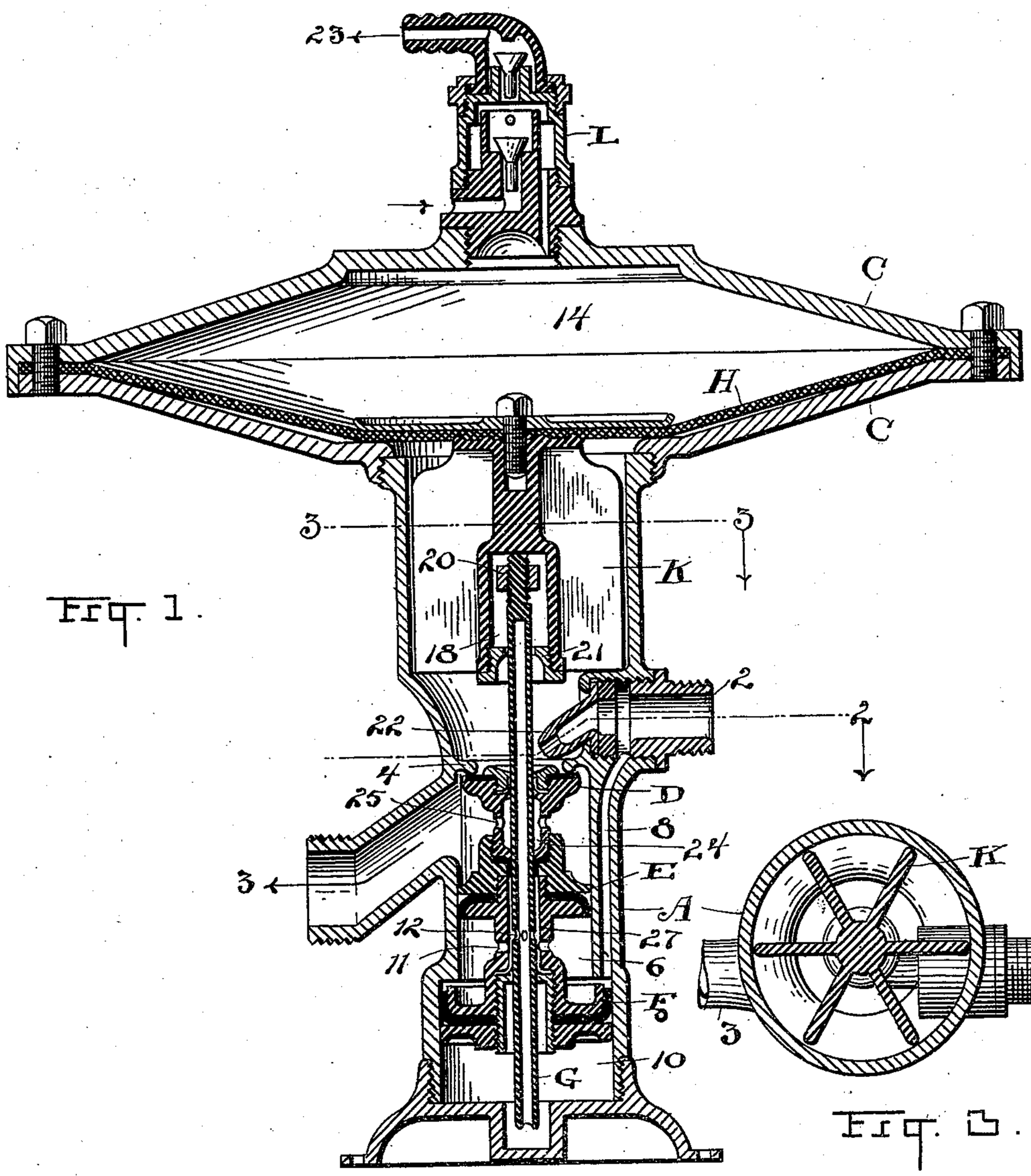
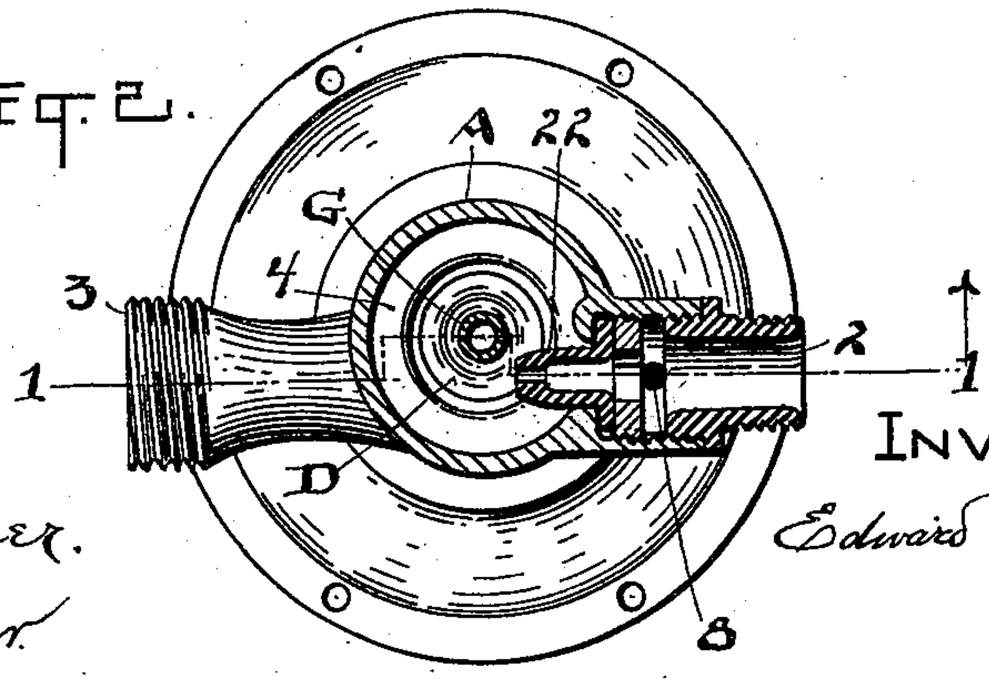


Fig. 1.

Fig. 5.

Fig. 2.



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EDWARD H. WEATHERHEAD, OF CLEVELAND, OHIO.

HYDRAULIC AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 562,163, dated June 16, 1896.

Application filed October 20, 1894. Serial No. 526,434. (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 has reference to hydraulic air-pumps, and the invention relates more especially to the variety of pump in which hydraulic pressure is used to pump or compress air and in which the operations are automatic, all substantially as shown and described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical central sectional elevation of a pump constructed according to my invention. Fig. 2 is a cross-section thereof on line 2 2, Fig. 1. Fig. 3 is a cross-section on line 3 3, Fig. 1.

A represents the casing or shell of the pump, including the base and body, and said casing may be made in two or more parts, as shall be found convenient.

C represents the diaphragm-casing at the top of the pump, containing or forming the air-chamber.

The water enters the pump through the inlet-port 2, which is connected with the main or source of supply, and exhausts through the outlet 3 on a lower horizontal plane than inlet 2, about as shown. Between the said inlet and outlet ports is interposed a valve D, which seats upon the lower side of the flange or rim 4 on the inside of casing A, arranged at the bottom of inlet-port 2 and at the top of outlet-port 3. Hence, when valve D is seated against this rim or flange the exhaust or outlet of water from the pump above said valve is cut off and closed.

The valve D has a reciprocating up-and-down movement and is connected with two differential pistons E and F, the latter having the larger area and adapted to a chamber made specially therefor at the bottom of the body A. Between said pistons E and F there is a space or chamber 6, which is constantly filled with water under pressure from the main through port 2 and the channel 8 in the casing A, leading from said inlet-port to said chamber. It would follow, with the difference in the size of the pistons E and F, as here shown, and with water-pressure constant in chamber 6, that the said pistons would be constantly down instead of up, but there are other elements which enter into the operation of the pump and which cause the said parts to travel up and down in their chambers and to perform the functions for which they are intended, as will now be described. Thus, referring to Fig. 1, we see all the parts as they appear at the instant when the pump is ready for action. In this position the pistons E and F are up as far as they can go and the valve D is closed against its seat 4, thus sealing the outlet from the water chamber or space above said valve. Now, having said valve closed and the chamber 10 beneath piston F being filled with water under pressure from the main through channel 8, chamber 6, openings 11 in the neck connecting pistons E and F, and the auxiliary valve-tube G, having inlet-holes 12, the said valve and the pistons E and F will remain up, as in Fig. 1, until the pressure beneath piston F is relieved. Before this can occur the valve-tube G must change position, and such change is effected only through the operation of diaphragm H and the guide or carrier. The diaphragm H is flexible and secured about its edge between the edges of the two sections of the casing C.

Suitable valved air outlets and inlets (indicated by L) are provided for the air-chamber 14 above diaphragm H, and the upper part of the casing A is fastened into a chamber adapted to receive and operate the guide and carrier K. The diaphragm H is fixed centrally to the center of guide K, so as to move therewith, and the guide K is so constructed as to afford a free passage for water to the under side of diaphragm H and a free exit when the exhaust occurs. Centrally in the said guide and opening downward is a chamber 18, into which extends the upper end of auxiliary valve G. This valve has an adjustable nut 20 on its upper end, forming a head which is confined in said chamber, and a stop 21 in the bottom of chamber 18 limits the downward movement of said valve G, the nut 20 en-

gaging the said stop. The inlet-port has a nozzle 22 extending inward into the pump, and said nozzle is inclined in the direction of discharge-port 3, so as to operate as an ejector when the valve D is opened and the exhaust from the pump takes place. Now, with valve D closed, as in Fig. 1, and the water entering the chamber or space above through diagonal or inclined nozzle 22, the said chamber will quickly fill with water and raise the diaphragm H and force the air in chamber 14 out through the discharge 23. Meantime valve D will remain closed and guide K will, of course, rise with the diaphragm. It can go about half-way before it will engage the nut or head 20 by catch or stop 21 and carry said valve up until the ports or holes 12 therein are brought into the chamber 24 in the neck between and uniting valve D and piston E. This neck has outlet-openings 25 into the general discharge. By this time the diaphragm H has done its work and is ready to descend, and this position is reached just as the openings 12 in valve G reach chamber 24. Then the water beneath piston F will be discharged and the said piston and the valve D will descend together, and thus the discharge-port 3 will be thrown open and the diaphragm H and guide K will descend in like manner. Now it occurs that the nozzle-jet 22 comes into action as an ejector to siphon and force the water out of the pump and thus compel its discharge in a much shorter time than could occur without this help. As the parts descend it occurs at last that the valve G is again forced down, so that by the time the piston F reaches the bottom the holes 12 in said valve will come down to water-chamber 27 in the neck uniting pistons E and F, and then the space beneath piston F will at once begin to fill again and soon the valve D will be closed once more, as seen in Fig. 1. From this point the operations are repeated, as already described.

In lieu of the guide or carrier K any equivalent construction thereof may be used. The one here employed is of metal and the weight is no objection, but other material might be employed.

Having thus described my invention, what I claim is—

1. The main casing having inlet and outlet ports, a valve to close the outlet-port and a pair of differential pistons rigidly connected with said valve, the said inlet-port being constantly open, substantially as set forth.

2. The construction described, consisting of the casing provided with inlet and outlet ports, a main valve to close the outlet-port an actuating-piston connected with said valve, and an auxiliary valve controlling the flow of water to the said actuating-piston, substantially as set forth.

3. The main casing having differential piston-chambers and inlet and outlet ports and an annular valve-seat between said ports, a main valve adapted to said valve-seat, and connected pistons in said differential chambers to operate said main valve, substantially as set forth.

4. The casing having inlet and outlet ports and a water-space constantly open to the inlet-port, a main valve to close said outlet and connected pistons to operate said valve, a pressure-controlling auxiliary valve through the main valve and pistons and a duct leading from the inlet-port to the space between the said pistons, substantially as set forth.

5. The casing having an outlet-port on a different transverse plane from the inlet-port and a valve-seat between said ports, a water-chamber at one side of said valve-seat, a diaphragm-chamber and diaphragm therein exposed to said water-chamber, a main valve for said valve-seat, operating-pistons for said main valve, and an auxiliary valve connected with said diaphragm and constructed and arranged to control the flow of water which operates the said main valve and pistons, all said parts arranged and operating, substantially as set forth.

6. The pump described, consisting of the casing with inlet and outlet ports and having a water chamber or space permanently open to the inlet-port, a valve having two controlling-pistons rigid therewith closing the outlet-port and an air-chamber and a diaphragm in said chamber on the top of the pump, substantially as set forth.

7. The main casing and the air-chamber at the top thereof, a diaphragm in said air-chamber, a water-chamber beneath said diaphragm, a valve closing said water-chamber at its bottom, an outlet for said water-chamber beneath said valve and a pair of differential pistons connected with said valve, substantially as set forth.

8. The main casing having inlet and outlet ports and a water-chamber, an air-chamber, a diaphragm in said air-chamber and a guide connected with said diaphragm and working in said water-chamber, in combination with a main valve for closing the outlet-port and differential pistons connected to said valve, and an auxiliary valve connected with said diaphragm, to guide and constructed to control the flow of the water which governs the main valve and its pistons, substantially as set forth.

Witness my hand to the foregoing specification this 16th day of July, 1894.

EDWARD H. WEATHERHEAD.

Witnesses:
H. T. FISHER,
GEORGIA SCHAEFFER.