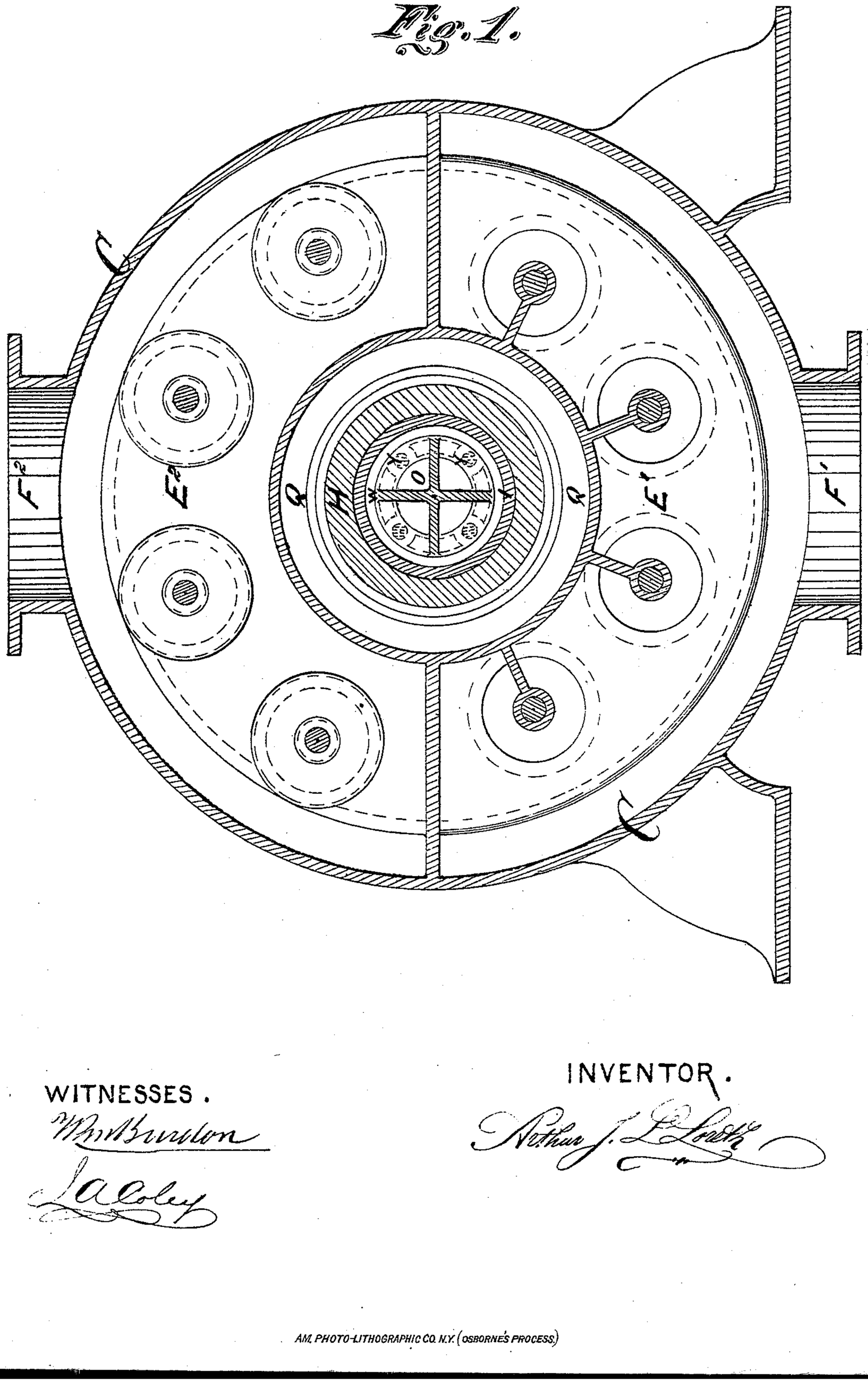
2 Sheets--Sheet 1.

A. J. L. LORETZ.

Compound High and Low Pressure Steam-Pumps.

No. 139,071. Patented May 20, 1873.

Fig. 1.



WITNESSES.

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Nathan J. L. Loretz

2 Sheets--Sheet 2.

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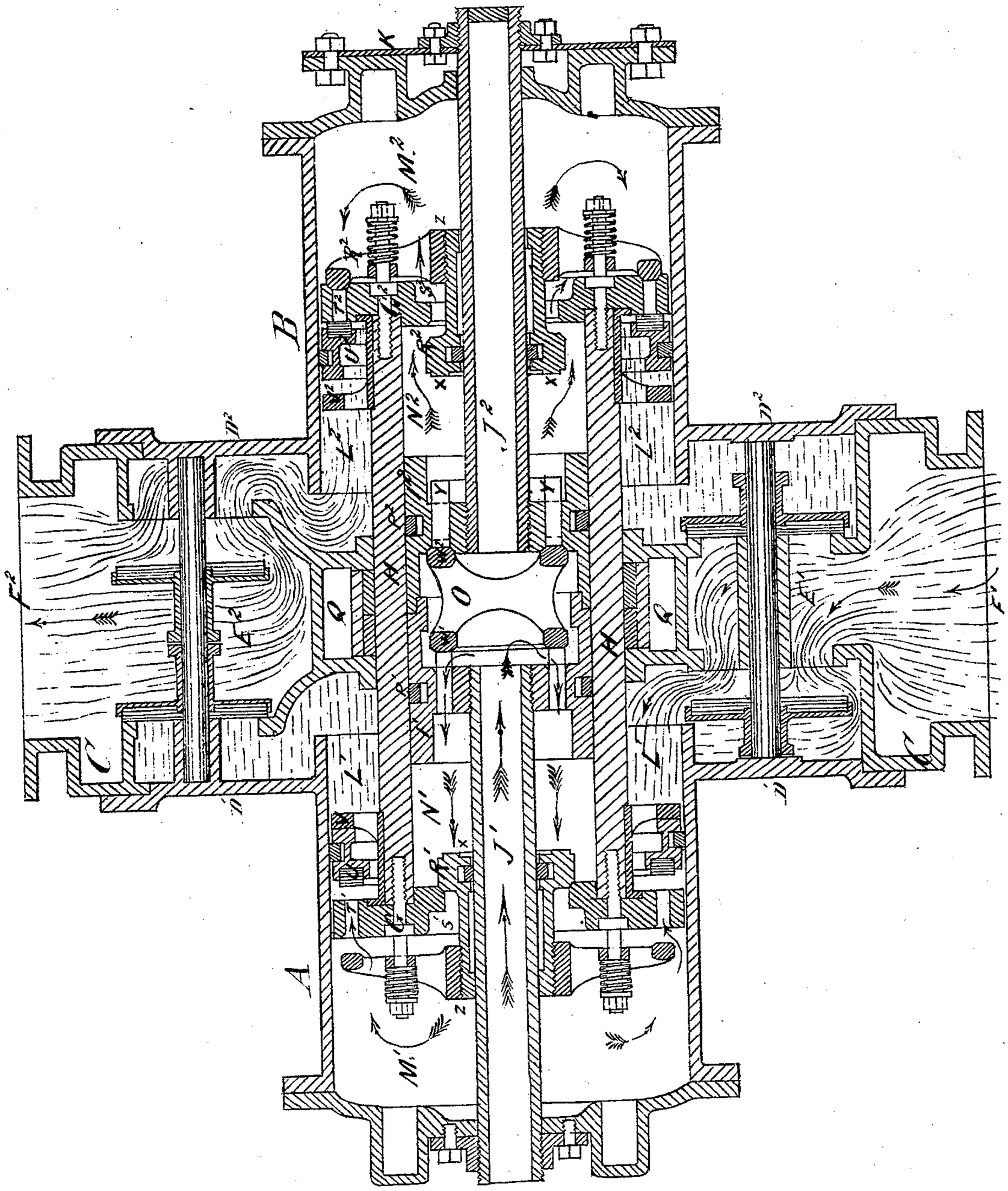
Fig. 2.



WITNESSES.

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Arthur J. L. Loretz

UNITED STATES PATENT OFFICE.

ARTHUR J. L. LORETZ, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN COMPOUND HIGH AND LOW PRESSURE STEAM-PUMPS.

Specification forming part of Letters Patent No. **139,071**, dated May 20, 1873; application filed October 9, 1872.

To all whom it may concern:

Be it known that I, ARTHUR J. L. LORETZ, of Brooklyn, in the county of Kings and State of New York, have invented a Compound High and Low Pressure Steam-Pump, of which the following is a specification:

My invention consists of two cylinders, A and B, Figure 2, bolted by flanges D^1 D^2 to each end of cylinder C, said cylinder C forming the water-valve chests, and being divided into two compartments, Figs. 1 and 2, E^1 E^2, each provided with four metallic disk-valves faced with rubber and working loose on spindles, compartment E^1 containing the suction-valves; also provided with nozzles F^1 and F^2, to which the proper suction and delivery-valves are attached. Each cylinder, A and B, Fig. 2, has a piston, G^1 and G^2, the two being connected together by the tubular piece H, thus uniting the two pistons and forming, with the cylinders A and B and water-chest C, four compartments or chambers, viz: L^1 L^2 M^1 M^2, two more, N^1 and N^2, being formed inside the tubular piece H by the steam-chests I^1 I^2, which is held in position by the tubes J^1 and J^2, through which the steam enters the chest, each tube being made fast to the heads of cylinders A and B—the tube J^2 being bolted to a wrought iron plate, K, which is bolted to head of cylinder B, making an expansion joint, thus allowing for the difference of expansion between the large cylinder and tubes. The steam-chest is made in two pieces, I^1 and I^2, in order to enter the steam-valve O. The steam-chest has also two grooves, one in each half, P^1 P^2, containing packing-rings, acted upon by the steam from the chest, thus packing the interior of tubular piece H, the outside being packed by spring-rings, or rings acted upon by the pressure of the water, set in the partition Q of the water-valve-chest cylinder C.

Thus, it will be seen that there are six chambers, viz: N^1 and N^2 being the high-pressure cylinders, M^1 and M^2 the low-pressure-cylinder chambers, and L^1 and L^2 the vacuum and and water cylinder chambers, the latter connecting directly with the water-valve chest.

The operation of the pump is thus: The steam, entering through either of the tubes J^1 or J^2, but now represented in Fig. 2 entering J^1, enters and fills the interior of the steam-chest I^1 I^2. The main steam-valve O having previously been thrown open, the steam enters through the valve-openings, as represented by the arrows, into the high-pressure steam-chamber N^1. Now, the steam-chest being held fast by the tubes J^1 and J^2, the steam will move the whole combination of piston G^1 G^2 and H forward; the steam, also pressing against the back of the valve R^1, shows it in its forward position, keeping the steam from escaping through the passage S^1 of piston G^1 into the low-pressure-cylinder chamber, the valve R^1 also opening the passage T^1 on the inside of low-pressure cylinder n', allowing the vapor that has been used in the previous stroke to escape through T^1, pass the annular water-valve U^1, which is open and bears against its guard, V, and then passing into the water-valve chest. The vapor, being below the atmospheric pressure, the atmosphere will force the water into the water-cylinder L^1, entering first the nozzle F^1, opening the section-valves, and then entering the cylinder L^1. Now, should the water enter with too great a velocity into the cylinder L^1, the annular water-valve U^1 will close the passage T^1, keeping the water from entering the low-pressure cylinder-chamber M^1; also packing the piston G^1 by acting upon the packing-rings in the valve U^1. The valve being closed and not allowing the vapor to pass into the water, and the space in the low-pressure cylinder, continually decreasing, the vapor being compressed, will again create a pressure, which will immediately open the valve U^1 again, allowing the steam to mix in with the water.

The part of the valve R^1 in the high-pressure-cylinder, around the tube J^1, is packed by a ring acted upon by the pressure of the steam in cylinder N^1.

Now, while the aforesaid operation is taking place in cylinder A, the high-pressure steam, which was previously in cylinder-chamber N^2, now passes through the passages S^2, of piston G^2, into the low-pressure-cylinder chamber M^2, and acting upon piston G^2, a port being in equilibrium with N^2, the valve R^2 closing the passage T^2, the valve being acted upon by the springs which, in the pre-

vious stroke, were kept compressed by the pressure of the steam acting upon the position of the valve in the high-pressure-cylinder chamber, as is just the case now in cylinder A—the friction of the valve R^2, when fitting around the tube J^2, being reduced by the pressure of the steam being taken off the the packing-rings in consequence of the high-pressure cylinder N^2 being thrown into equilibrium with the low-pressure cylinder M^2. The annular water-valve, which is faced with rubber, closing the passage T^2 of the piston G^2, being acted upon by the atmospheric pressure and the height of the column of water to which it is forced, the piston G^2 being packed by the water-pressure acting on the packing-rings in the water-valves U. Now, when the pistons approach the ends of their stroke, the face X of the valve R^2, in the cylinder-chamber N^2, will strike the projecting tappets Y of the steam-valve O, that valve being acted upon by the pressure of the steam on the outside; and there being almost a perfect vacuum on the outside in cylinder N^2 by the entire expansion of the steam, the valve R^2 will then, of course, move toward its seat in preference to the opening of the valve O, thereby closing the flanges S^2, the blow of closing being somewhat checked by the compressing of the spring acting against the valve in the cylinder M^2. The valve R^2 being seated on the face of piston G^2, we then have the entire pressure of steam in cylinder-chamber N^1 to open the valve O on the side of the cylinder N^2. Now, as soon as the steam enters the cylinder N^2, the passage S^2 having previously been closed, the pressure of steam in cylinder N^2 will become equal to that in the steam-chest—that is, before the piston G^2 begins to move—thus placing the one-half, W^2, of the valve O in equilibrium. Again, while the valve R^2 has opened the steam-valve O by striking the tappets Y, the valve R^2, in cylinder M^1, has struck the cylinder-head of A with its face Z, opening the passage S^2 of piston G^1, the steam in cylinder N^1 rushing into the low-pressure cylinder M^1. The pressure being thus diminished, the side W^1 of valve O will be thrown out of equilibrium, causing it to fly over and close the steam-openings of cylinder N^1 and opening those of cylinder N^2. The steam being shut off from cylinder N^1, and the valve R^1 having been opened a little by the aforesaid operation, and the pressure which kept the valve R^1 on the seat of piston G^1 being almost reduced to an equilibrium, the spring, acting upon the valve in cylinder M^1, will throw the valve entirely back, closing the passage T^1, keeping the expanding steam from going through into the water, the friction of the valve R^1 around the tube J^1 being also reduced by not being acted upon by the steam, there being an equilibrium of steam in the cylinders N^1 and M^1. When the pressure of the expanding steam falls below that of the atmosphere, or that of the height of the column of water that is being pumped, then the annular water-valve U^1 will keep the water from entering the cylinder M^1 through the passage T^1, also packing the piston G^1, with the water acting upon the packing-rings in its periphery.

Having explained my invention, what I claim and desire to secure by Letters Patent, is—

1. The arrangement of the pistons G^1 G^2, in their cylinders A and B, connected by tubular piece H, the partition Q of the vacuum and pump chamber C, the steam-chest I^1 I^2, and chambers N^1 N^2, M^1 M^2, and L^1 L^2, all constructed to operate substantially as and for the purpose set forth.

2. The combination of the double-valve R, its packing and spring-rings, the tubes J^1 J^2, with the cylinder N^1 N^2 and M^1 M^2, all arranged substantially as shown and for the purpose specified.

3. The combination of the annular-valve U, provided with packing-rings, with the double-valve R, arranged substantially as shown, and for the purpose described.

4. The combination of the steam-chests I^1 I^2, having grooves F^1 F^2, and packing, with the double valve O, tappets Y, connecting tube H, tubes J^1 J^2, secured to cylinders A and B, and suitable openings, substantially as and for the purpose herein described.

5. The cylinders A B, bolted with flanges D^1 D^2 to the chamber C containing the suction and delivery rollers, in combination with the pistons G^1 G^2, passages S T, tube H, double valve R, annular valve U, steam-chest I, valve O, and tubes J, all arranged substantially as and for the purpose specified.

ARTHUR J. L. LORETZ.

Witnesses:

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J. A. COLEY.