3 Sheets--Sheet 1.

# A. J. L. LORETZ.

## Steam-Pumping Engines.

No. 134,689. Patented Jan. 7, 1873.

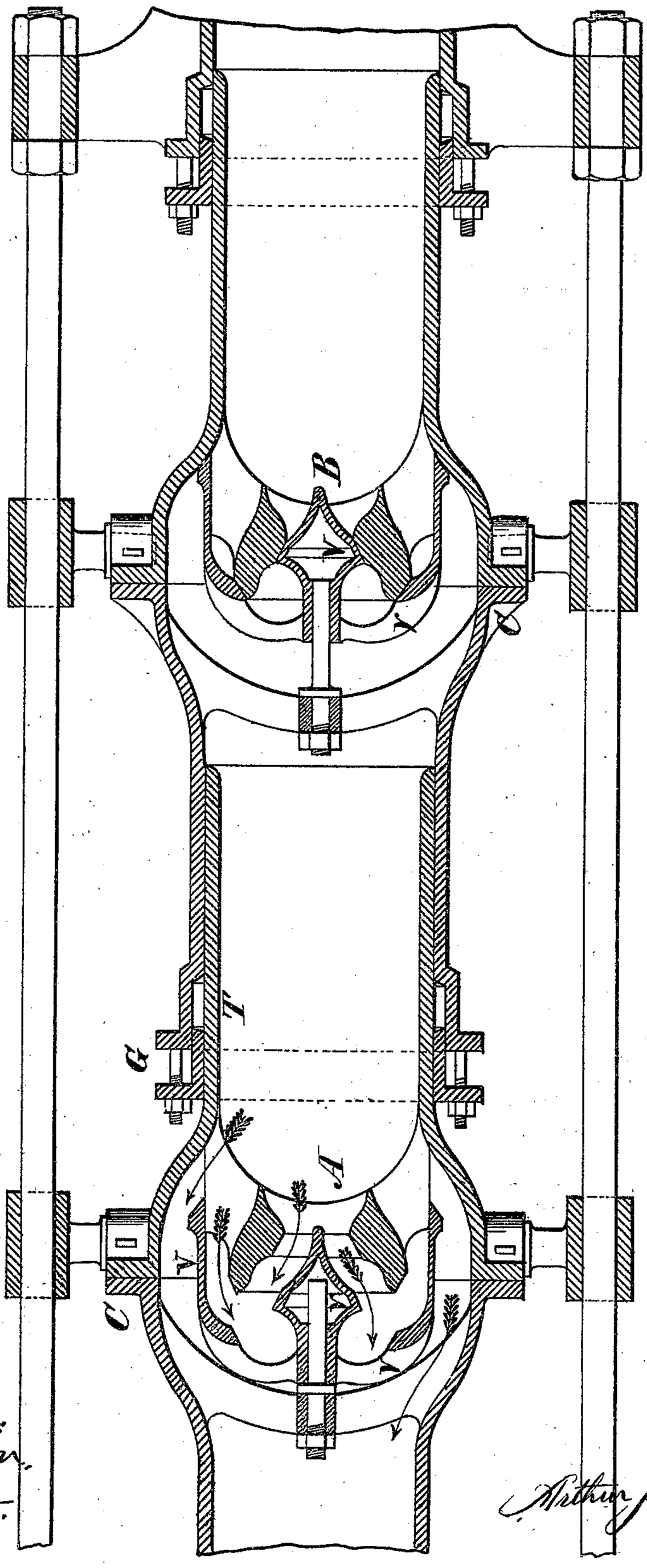



Fig. 1.

Witnesses:
Wm Burden.
J. B. Loretz.

Inventor:
Arthur J. L. Loretz

3 Sheets--Sheet 2.

# A. J. L. LORETZ.

## Steam-Pumping Engines.

No. 134,689. Patented Jan. 7, 1873.

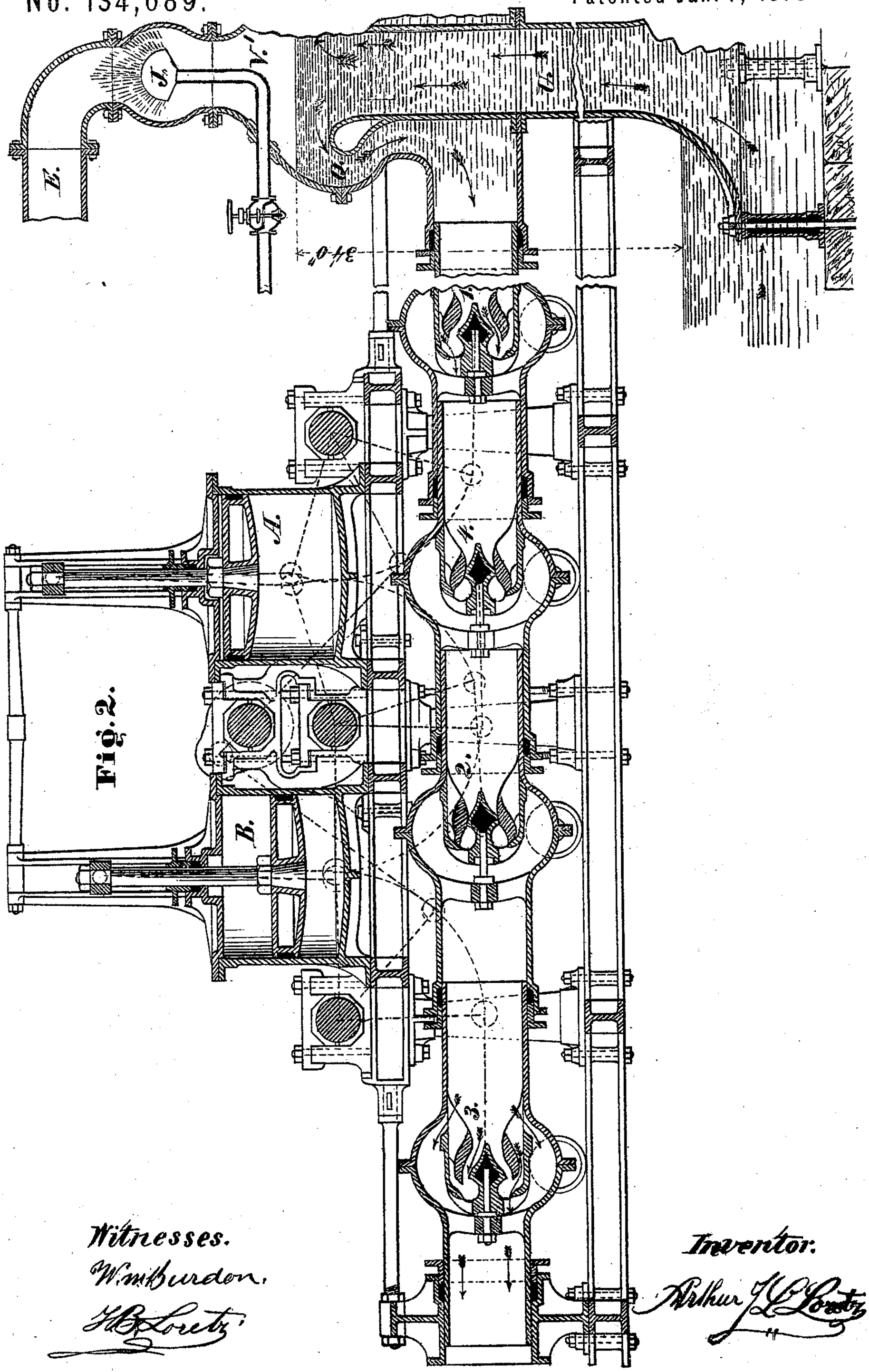



Fig. 2.

Witnesses.
W. M. Burdon.
H. B. Loretz.

Inventor:
Arthur J. L. Loretz

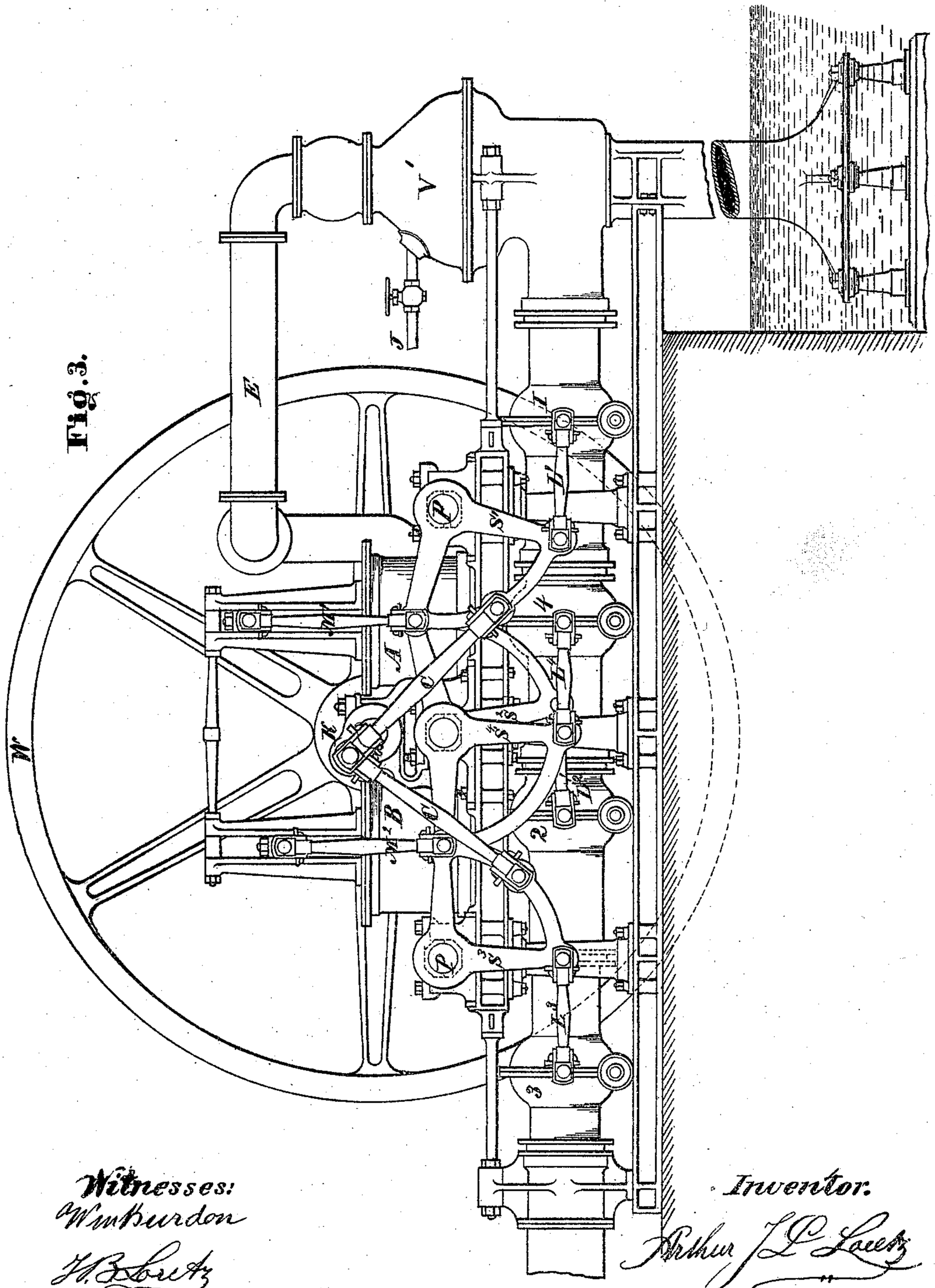
3 Sheets--Sheet 3.

# A. J. L. LORETZ.

## Steam-Pumping Engines.

No. 134,689. Patented Jan. 7, 1873.

Fig. 3.




Witnesses:
A. Wm. Burdon
H. B. Loretz

Inventor:
Arthur J. L. Loretz

# UNITED STATES PATENT OFFICE.

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

## IMPROVEMENT IN STEAM PUMPING-ENGINES.

Specification forming part of Letters Patent No. **134,689**, dated January 7, 1873.

*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 Pumping-Engine, of which the following is a specification:

The first part of my invention relates to a series of pipes which are of the diameter of the moving column of water and are enlarged at their centers C, where united. Said enlargement is to be of sufficient size and so shaped as to form a valve-chamber, containing a triple-beat valve, V, (or any other,) which, when at its full lift, as at A, will have an area equal to that of the pipe; or, in other words, will allow the moving column of water to pass through without increasing its velocity at any point. Those series of pipes, at their straight or tubular position at each end of the valve-chamber C, are constructed so as to slide into each other similar to a telescope, the tubular portion at the one end being provided with a stuffing-box and gland, G, to receive the turned portion of the other end T. Four of these sections are placed in immediate connection, as in Plate 2, and each section connected with a link, L, Plate 3, one at each side of the section, said links L, coupled to segments S, vibrating on center pins P, and connected, through the links M, to the cross-heads of steam-cylinders A or B.

Plate 3 represents two vertical steam-cylinders, A and B, connected on the quarter to the crank K keyed to the shaft of fly-wheel W. Each cylinder connects to two pair of vibrating segments, viz: Cylinder A to segments $S^1$ and $S^2$; also cylinder B to segments $S^3$ and $S^4$. These segments connect, in turn, to their respective pipe-sections through the links $L^1$ $L^2$, &c., the stroke of piston of each cylinder causing its pair of segments to contract in the up-stroke and expand in the down-stroke, carrying the pipe-sections with them, and causing them to move forward and backward, and giving to each section a different movement.

Now, referring to Plates 2 and 3, we find the piston of cylinder A at the end of the up-stroke, which, by means of its connections, has drawn section 1 to the extreme forward stroke, having completed its lift of water and ready, with valves open, to return to prepare itself for its next forward stroke; the other, section 2, being drawn to the extreme backward-stroke, having its valves closed and ready to start on its forward stroke, carrying the column of water ahead of it. Now, while cylinder A and its pump-sections are in this position, the piston of cylinder B is at half-stroke and in its full operation, drawing section 4 on its forward stroke, carrying the column of water ahead of it, while section 3 is returning (with valves open allowing the water that section 4 is forcing to pass through) to prepare itself for its next forward-stroke. Thus it will be seen that the current of water is continuous, without the aid of an air-chamber, and of an equal velocity throughout; which two combining effects have heretofore not been accomplished in a lifting pump—it being impossible to pass as much water through the valves of a piston as through the cylinder in which the piston moves, without increasing the velocity of the water. The second part of my invention consists in using the rising column of water that is being pumped as a jet to condense the exhaust-steam from the cylinders A and B, the main pump, or sections 1, 2, 3 and 4, acting as a continuous air-pump.

Plates 2 and 3 represent this arrangement. E is the exhaust-pipe as it comes from the steam-cylinders and enters the upper part of the vacuum-chamber V′. The upper part of this chamber is enlarged so as to offer as large a sheet of water as possible to the exhaust-steam, this sheet of water being continually replenished, when the engine is in operation, by the rising column in the center, which then passes over into the annular space, and from thence into the main pump or current. The jet J is used, before starting the engine, so as to create a vacuum. When starting, the engine is blown through, filling the vacuum-chamber with steam, driving all the air out through the bottom bell-mouth, where the water enters. When the chamber is filled with steam and all air excluded, the valve in jet-pipe J is opened and condenses the steam. The vacuum being formed, the jet-valve is closed and the water begins to rise until it reaches its proper height, as represented in Plate 2, when the engine is ready to start.

The steam in cylinders A and B being cut off at one-twentieth of the stroke with an initial pressure of forty pounds per square inch, including the atmospheric pressure, will have

a terminal pressure of two pounds per square inch, (126° of heat,) which, practically, will fall considerably below, being almost a perfect vacuum at the end of each stroke. The diameter of each cylinder, in the present instance, being twenty-four inches, the volume of steam for each full stroke of pump equals five hundred and forty-two cubic inches, which is equal to eight-tenths cubic inches of water. The pumps or tubes, being twelve inches diameter by twelve inches stroke, will deliver one thousand three hundred and fifty-six cubic inches of water. So large an amount of fresh water coming in contact with only eight-tenths of a cubic inch must evidently keep up a good vacuum, all air by leakage and other causes being carried off by the moving tubes.

I claim as my invention—

1. The movable telescopic tubes T, united and enlarged at their centers C sufficiently to contain a valve, V, having a water-passage equal in area to that of the tubular piston, when all constructed substantially as shown and for the purpose herein described.

2. The vacuum-chamber V with its internal pipe U and its annular space Q arranged substantially as and for the purpose herein described.

3. The combination of the segments $S^1$ $S^2$ $S^3$ $S^4$, and the connecting-rods C C, crank K, links $M^1$ $M^2$, and cylinders A B, substantially as and for the purpose herein described.

4. The telescopic tubes T provided with valves V, the vacuum-chamber V′, its annular space Q, and jet J, in combination with the segments $S^1$ $S^2$ $S^3$ $S^4$, connecting-rods C C, crank K, links $M^1$ $M^2$, and cylinders A B, all substantially as and for the purpose set forth.

ARTHUR J. L. LORETZ.

Witnesses:

WM. BURDON,

T. B. LORETZ.