

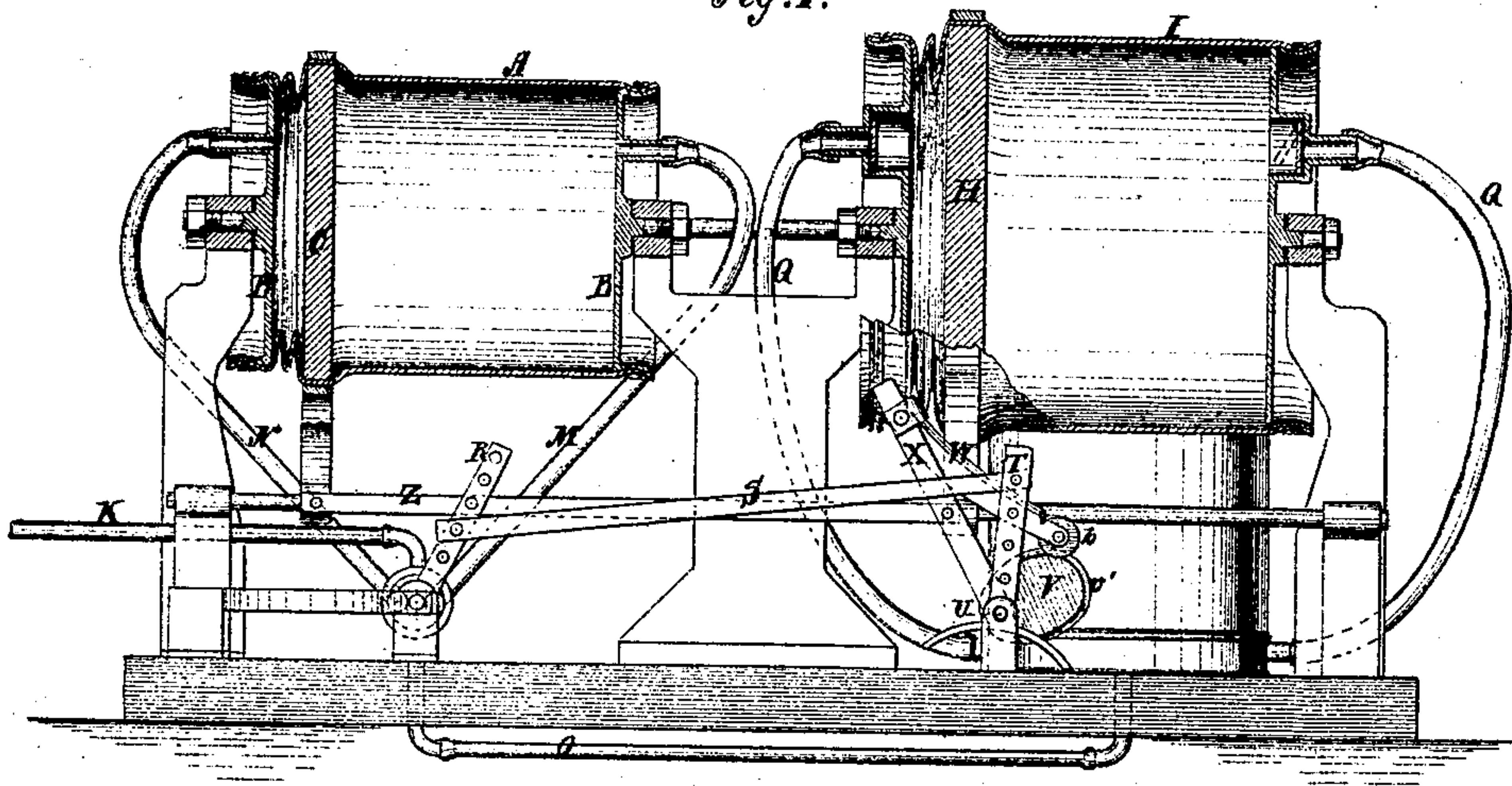
*J. Ashworth,* 2. Sheets, Sheet 1.

*Hydrogen Gas Machine.*

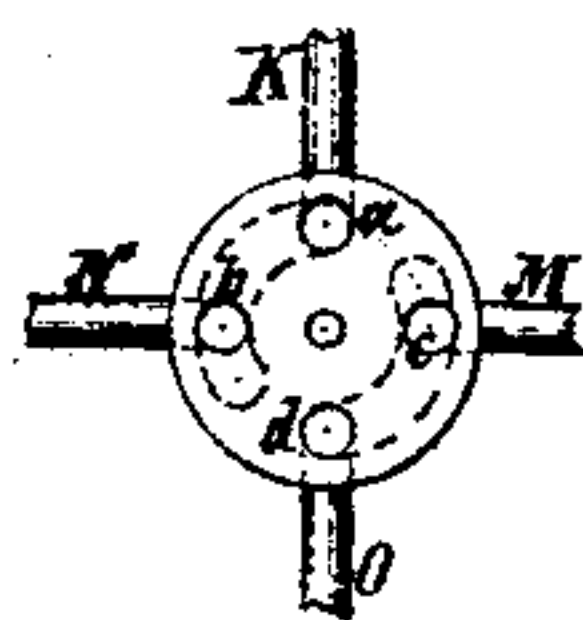
*No. 102,203.*

*Patented Apr. 26. 1870.*

*Fig. 1.*



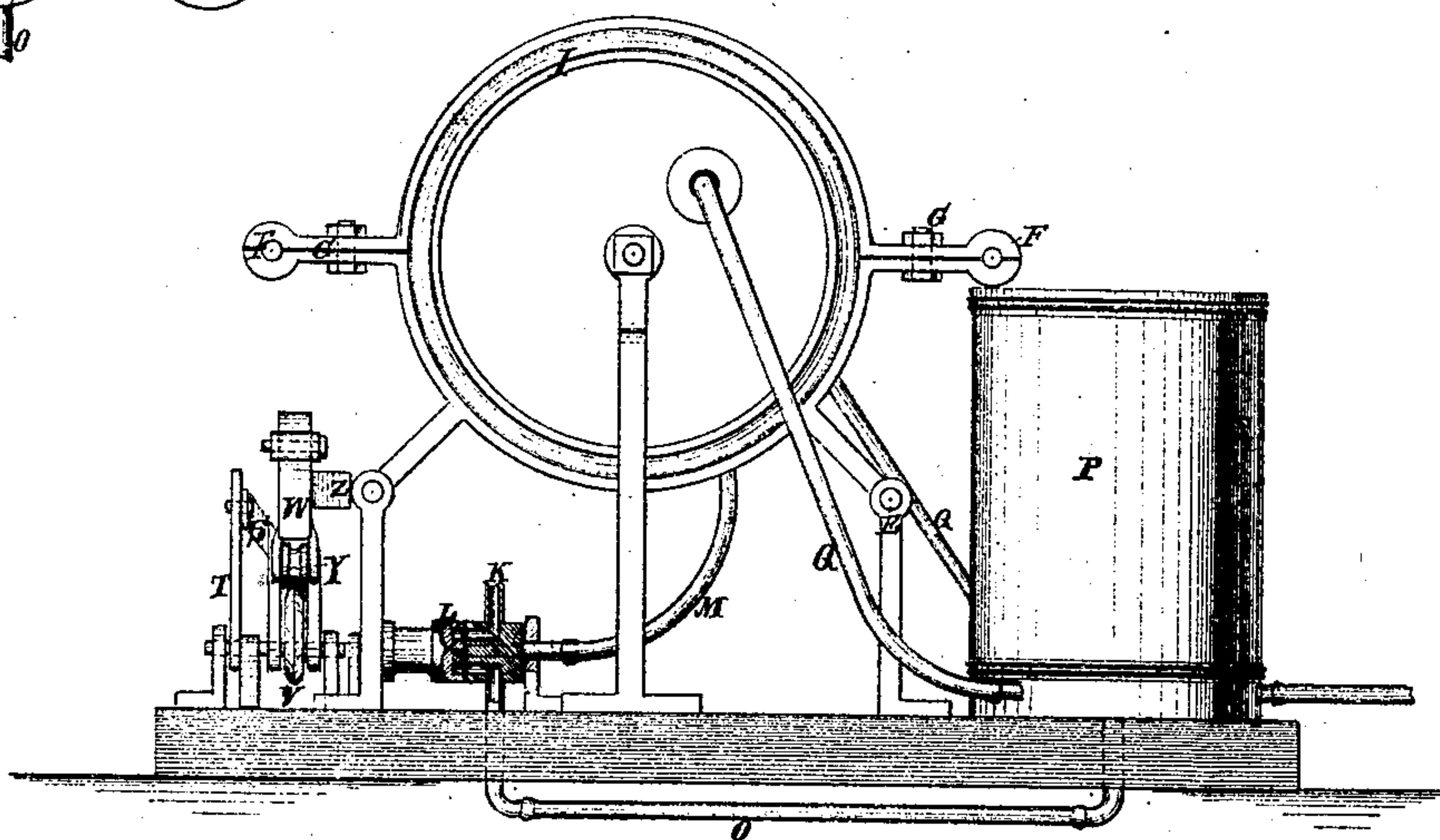
*Fig. 4.*



*Fig. 5.*



*Fig. 2.*



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**Inventor:**

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**PER**

*Wm. L.*

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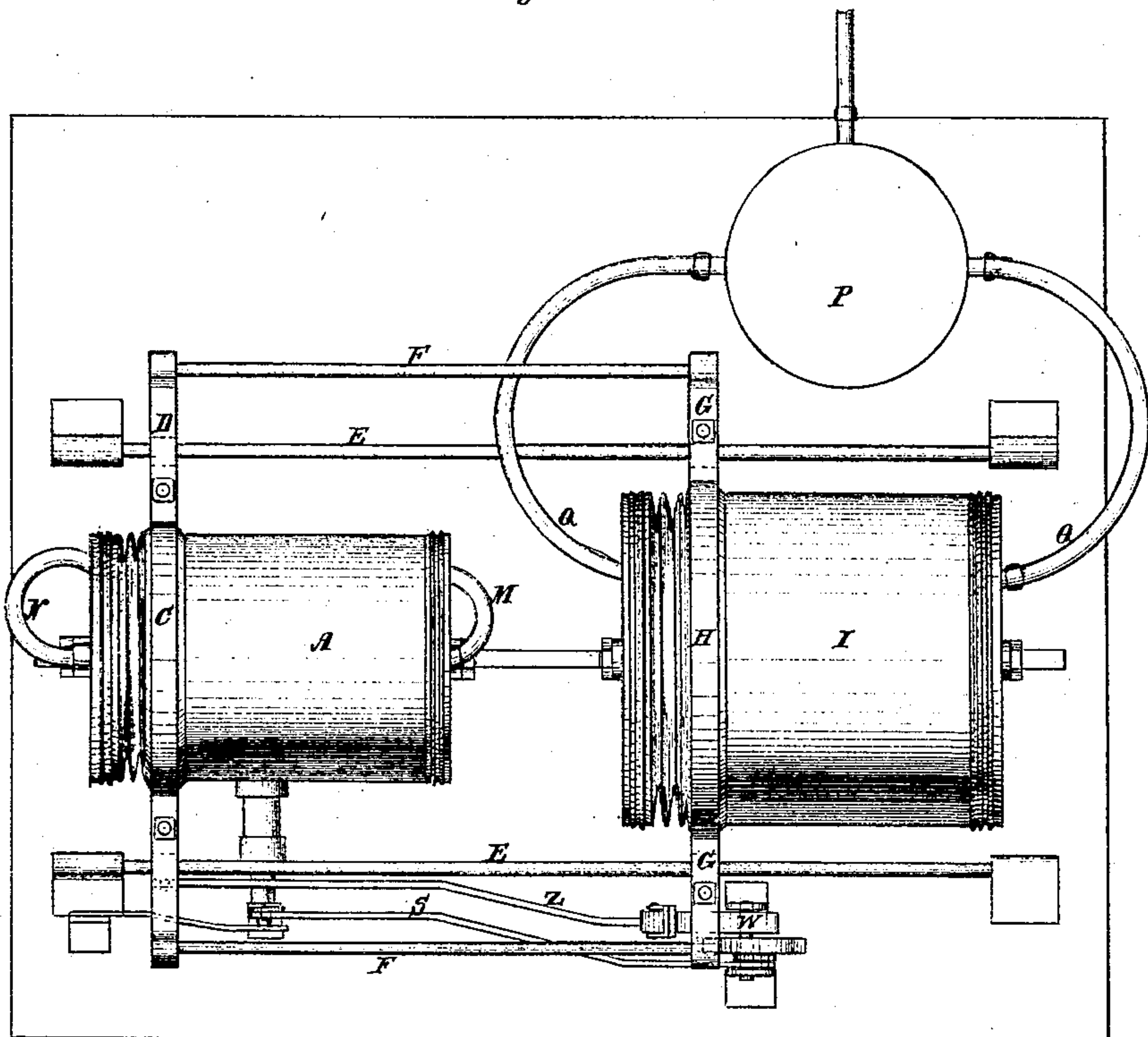
*D. Ashworth, 2. Sheets, Sheet 2.*

*Hydrogen Gas Machine.*

*No. 102203.*

*Patented Apr. 26. 1870.*

*Fig. 3.*



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# United States Patent Office.

DANIEL ASHWORTH, OF WAPPINGER'S FALLS, NEW YORK.

Letters Patent No. 102,203, dated April 26, 1870.

## IMPROVEMENT IN APPARATUS FOR MIXING HYDROGEN AND AIR.

The Schedule referred to in these Letters Patent and making part of the same

*To all whom it may concern :*

Be it known that I, DANIEL ASHWORTH, of Wappinger's Falls, in the county of Dutchess and State of New York, have invented a new and improved Hydrogen Gas and Air Mixer; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings forming part of this specification.

This invention relates to improvements in apparatus for utilizing the pressure of hydrogen gas, due to the generation of it in closed vessels, for mixing with it the requisite quantity of atmospheric air, and for supplying a burner with the mixture, under the requisite pressure, to dispense with the blow-pipe in fusing metals; and

It consists in a combination with a gas-cylinder and an air-cylinder of collapsible substance with fixed heads and movable partitions, the movable partitions of each being connected, so that the one belonging to the gas-cylinder being propelled will actuate the other, of a four-way cock for supplying and exhausting the gas, and mechanism for shifting the same, whereby the gas-cylinder and the said mechanism becomes a motor for operating the air-cylinder as a double-acting pump for forcing air into a receiver, into which the gas-cylinder exhausts, and from which the flame is supplied, the quantities of each being governed by the capacities of the respective cylinders, which are intended to be in about the proportion for one of gas and two of air.

Figure 1 represents a longitudinal sectional elevation of my improved apparatus;

Figure 2 is an end elevation of the same, except the four-way valve, which is shown in section;

Figure 3 is a plan view;

Figure 4 represents a face view of the stationary part of the four-way valve; and

Figure 5 represents a face view of the movable or oscillating parts.

Similar letters of reference indicate corresponding parts.

A represents the gas-cylinder, which, in this instance, is made of flexible India rubber, with metallic heads B, of sheet metal, fixed in suitable supports, and provided with a partition, C, of wood or other substance, provided with arms D, fitted on rods E to slide back and forth, also connected by rods F to a similar arm, G, of partition H in the air-cylinder I, of similar construction, to cause the two to move in unison.

K is the supply-pipe leading from the gas-generator to the four-way valve L.

M is the induction and exhaust-pipe leading from

the said valve to one end of the cylinder A; and N is a similar pipe leading to the other end.

O is the exhaust leading from the valve to the receiver P.

Q represents the air-pipes leading from the cylinder I to the receiver. The air is let into the cylinder I through openings in the heads, which have inside valves which close them when the pressure is toward them.

The four-way valve oscillates on its horizontal axis, and has an arm, R, connected by the rod S to the arm T, connected at U to a shaft, whereon is fixed the cam-plate V, which is worked back and forth by a spring, W, attached to the free end of an arm, X, and bearing with considerable pressure on the face of the cam-plate through the medium of a friction-roller, Y, attached to it.

The arm X is connected by a bar, Z, to the moving partition C, or to an arm thereon, and is vibrated by it. This cam-disk and the spring and the connections are so arranged that the moment the partition C arrives at the outer end of the cylinder the roller Y will have passed so far beyond the point V' of the disk, at the greatest distance from its axis of motion, as to force it over on its axis one way or the other, as the case may be, and vibrate the arms T R and the valve, thereby shifting it.

The arms R and T are arranged for shifting the connection of the bar S to vary the movement of the valve as may be required.

In fig. 1 the partition C is represented as having arrived at the end of its movement to the left, and the spring and its roller as having passed the point V' upward, and forced the cam-disk down, shifting the valve so as to open the exhaust from pipe M to O, and the induction from R to N.

It will be seen that the air-pumping cylinder, being worked by the gas at the same speed of the other, through the connections of the partitions H, that the air will be taken in and mixed with the gas in the receiver in the exact proportion of the relative sizes of the cylinder, and that the receiver being connected with the burner, the latter will be supplied with a mixture of air and gas at the pressure due to that of the confined mixture in the receiver, which may be regulated in any approved way.

In fig. 4—

a represents the supply-port, with which the pipe K connects;

b is the port for the pipe N;

c, the port for the pipe M; and

d, the port for the pipe O.

The oscillating part of the valve, fig. 5, has two curved passages, e f, one of which is, by the oscillation of the said part, alternately brought to open the

passage from *a* to *c* and from *c* to *d*, and, in like manner, the other alternately opens the passage from *a* to *b* and from *b* to *d*, thereby supplying and exhausting the opposite ends of the cylinder alternately.

Having thus described my invention,

I claim as new and desire to secure by Letters Patent—

1. The combination of the gas and air-cylinder, provided with the reciprocating partitions connected together for joint action as described, of the four-way valve, the valve-actuating mechanism, the connecting-pipes, and the receiver, all substantially as specified.

2. The combination with the reciprocating partition C and the valve-arm R of the vibrating arm X, the spring W, cam-disk V, arm T, and rod S, substantially as specified.

3. The four-way valve, constructed and arranged substantially as specified.

The above specification of my invention signed by me this 9th day of March, 1870.

DANIEL ASHWORTH.

Witnesses:

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