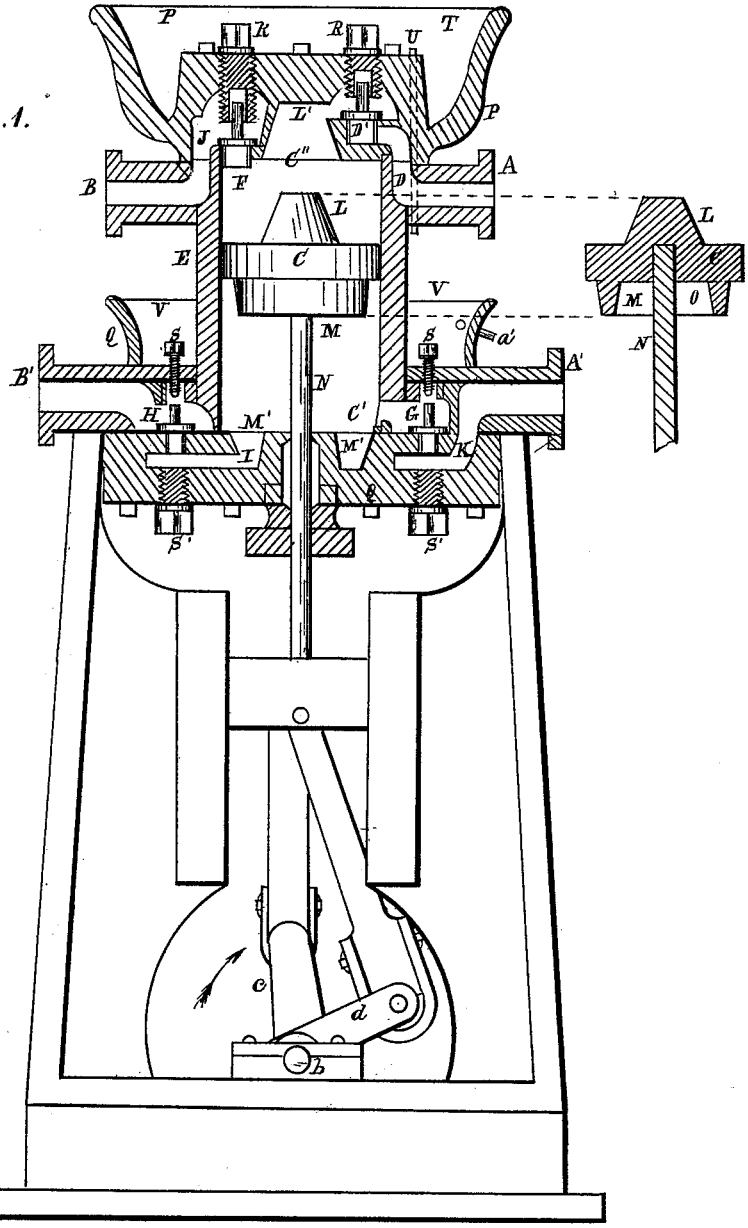
3 Sheets—Sheet 1.

J. ENRIGHT.

Ammoniacal Gas-Pump.

No. 202,641. Patented April 23, 1878.

Fig. 1.



Witnesses.
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Ammoniacal Gas-Pump.

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Fig. 2.

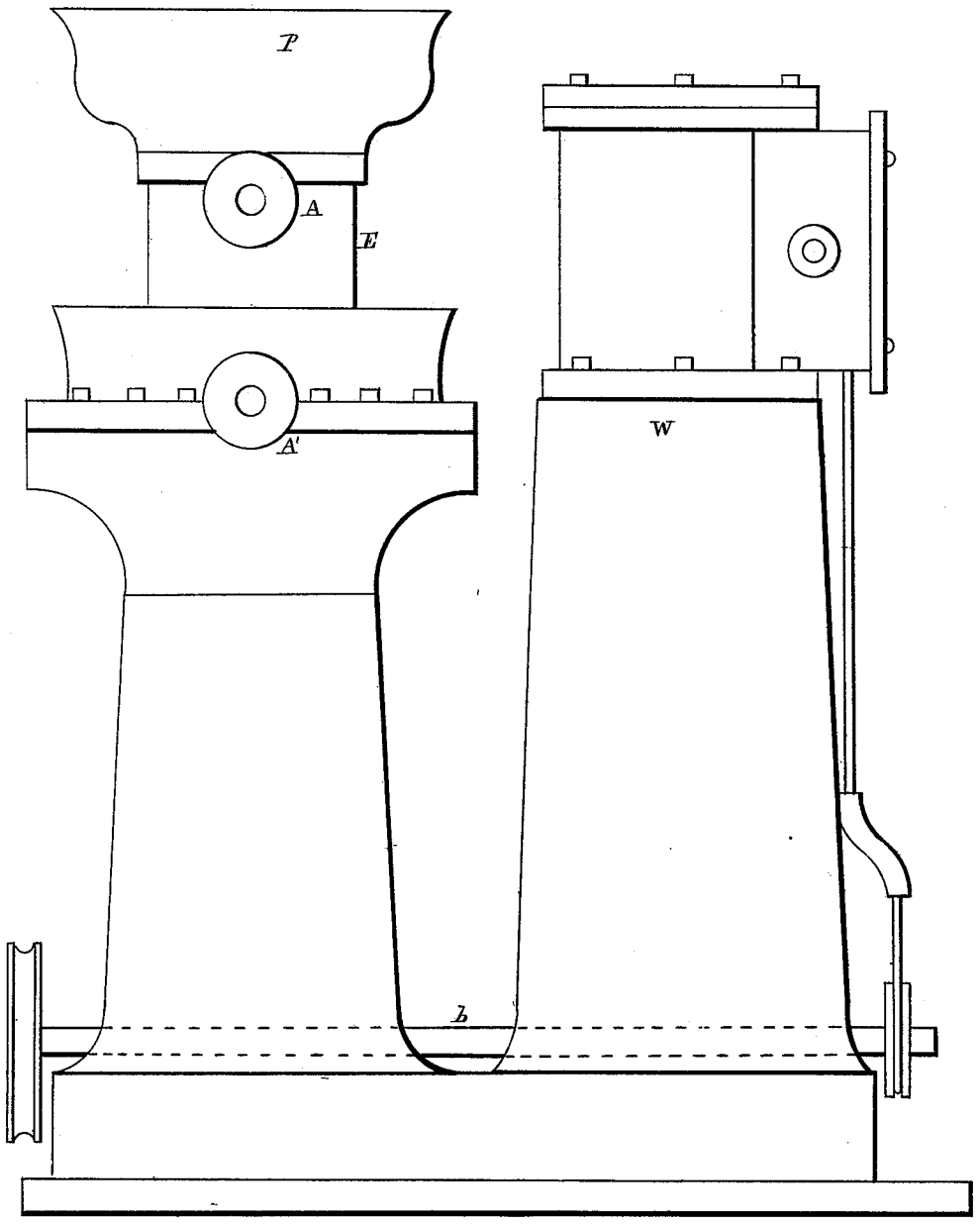

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Fig. 3.

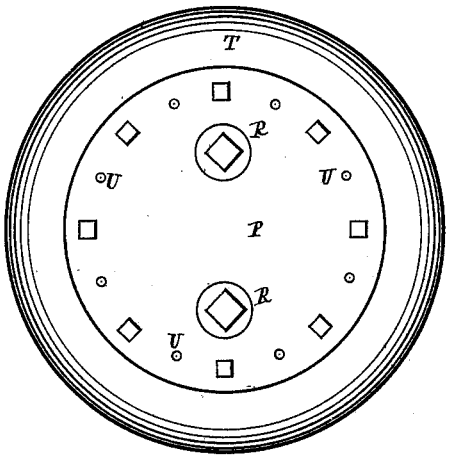


Fig. 4.

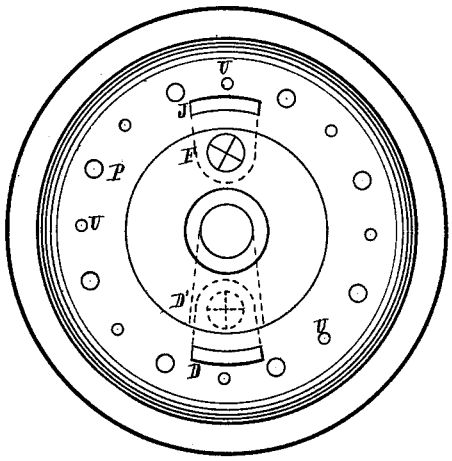
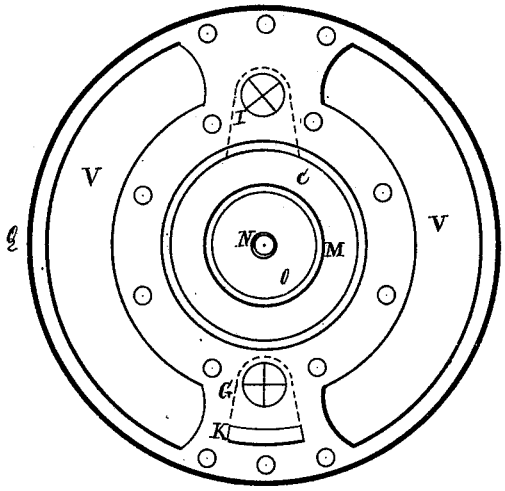


Fig. 5.



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UNITED STATES PATENT OFFICE.

JOHN ENRIGHT, OF CLEVELAND, OHIO.

IMPROVEMENT IN AMMONIACAL-GAS PUMPS.

Specification forming part of Letters Patent No. **202,641**, dated April 23, 1878; application filed March 5, 1878.

To all whom it may concern:

Be it known that I, JOHN ENRIGHT, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and Improved Ammoniacal-Gas Pump for Manufacturing Ice, &c.; and I do hereby declare that the following is a full, clear, and complete description thereof, reference being had to the accompanying drawings, making a part of the same.

Figure 1 is a vertical transverse section in part. Fig. 2 is a side elevation, showing the engine for working the pump. Figs. 3, 4, and 5 are detached sections, enlarged, which represent different views of the cylinder-heads.

Like letters of reference refer to like parts in the several views.

The nature of my invention relates to certain improvements in gas-pumps for manufacturing ice, for cooling air, and for the preservation of fruits, meats, vegetables, beer, and other perishable articles.

The distinguishing features of the improvements relate to the arrangement of the induction-pipes, which are connected with a coil containing ammoniacal gas, which is drawn from said coil or pipes by means of a piston, and working in a cylinder and forced out through eduction-pipes into a condensing-chamber.

It also relates to the construction of the piston, in its relation with the cylinder, and to the valves in connection therewith and the ports or valve-openings. Said pump is operated by a steam-engine connected therewith.

The improvement further relates to water-basins, one at the upper part of the cylinder, and one below. The upper one is charged with water, from which it flows through openings over the outside of the cylinder to cool it into the lower basin, and escapes.

The improvement also relates to the construction and arrangement of the piston in connection with the cylinder and heads thereof, whereby the gas admitted into the cylinder is so effectually forced out through the eduction-openings that but little or no gas remains in the cylinder to react upon the stroke force of the piston by the expansion of such remaining gas.

Reference will be had to the accompanying drawings and following description for a more full specification of the said invention.

In the drawings, A A′ are induction-pipes, which are connected with a coil or system of pipes containing the ammoniacal or other gas to be employed. Said coil is in communication with a condenser, where the gas, by compression, is converted into a liquid.

The object of this pump is for conveying the ammoniacal gas or its equivalent from the coil to a condenser. Hence the said pump is intermediate between the coil or pipes and condenser.

So far as the coil or system of pipes containing the gas and the chamber or condenser for condensing the said gas into a liquid are concerned, I do not claim them as new; but I do claim that the said pump may be used in connection with any system of pipes and condenser for the purposes herein set forth.

The coil or system of pipes connected with the inlets A A′, Figs. 1 and 2, are arranged in a tank and surrounded with water, but may be used without this for cooling air for especial purposes.

The ammonia is in a liquid state when first admitted into the coil of pipes from a chamber containing liquid ammonia. This fluid expands in the coil into a gaseous state, which produces cold, and causing said pipes to become so intensely chilled as to freeze the water surrounding them in the tank into ice; for as the gas is being drawn off by the pump, the expansion of the liquid ammonia into gas takes place in the pipes, there being created a vacuum in the pipes more or less by the action of the pump, which vacuum admits of this gaseous expansion. After the gas has been received into the pump, it is forced out through the eduction-pipes B B′, Fig. 1, into a condenser, where it is condensed into liquid ammonia, its original state before entering the coil, it being converted from a gaseous to a liquid state in the condenser while under compression.

In Fig. 1 the arrows indicate the passage or direction of the gases through the ports, valves, passages, pipes, and cylinder of the pump. When the piston C is at its lowest stroke C′ the gases from the coil enter the cylinder at the upper end C″ through the in-

duction-pipe A, port D, and valve D′, and while the gas is entering the upper end of the cylinder E the piston is on the lower stroke, and the valves F and G are closed, while the valve H is opened by the gas, which is supposed to be in the lower part of the cylinder, being forced out by the action of the piston through the port I, valve H, and eduction-pipe B′ into the condenser. On the return or upward stroke of the piston, the gas which had been admitted into the upper part of the cylinder, as before mentioned, is forced out through the valve F, port, and eduction-pipe B into the condenser. At the same time the valves D′ and H are closed, the valve D′ being closed by the force of the gas under the pressure of the piston in passing out through the eduction-pipe B; and while the piston is thus rising the gas is passing in through the induction-pipe A′, port K, and valve G into the lower part of the cylinder, and is forced out by the downward stroke of the piston through the passages to the condenser, as before stated. Thus alternately the gas is admitted to the upper and lower ends of the cylinder through the pipes A and A′, and also alternately forced out through the eduction-pipes B and B′ into a condenser, as described.

The piston is made with a cone or projection, L, on its upper side, and on the under side an annular collar or rim, M, leaving a space, O, around the piston N, as seen in Figs. 1 and 5. The cone L is designed to fill up the conical cavity or recess L′ in the upper head P, Figs. 1, 2, 3, and 4, which is in open communication with the valve D′, as seen in Fig. 1, and the rim M fills up the annular space M′ in the lower head Q, Figs. 1 and 5. By means of the cone L and annular rim M, in connection with the conical cavity L′ and annular groove M′, all the gas which is received into the cylinder through the induction-passages at either end is forced out so effectually that the remaining gas is not sufficient in its expansive force to retard the stroke of the piston, which would be the case with a piston in a pump of the ordinary construction; and also the piston, by this means, can have the full sweep of the cylinder, as the eduction-openings are at the extreme ends thereof. Thereby the gas is so effectually forced out through the said passages as to leave little or no gas to react upon the stroke of the piston.

The upper and lower heads are secured to the cylinder by means of screw-bolts or other suitable means. In the upper head are guide or gage screws R, with a hole in the ends to receive the valve-stems, as seen in Fig. 1. By means of these screws the lift or opening of the valves D′ F is controlled, as may be required in the working of the pump. The holes in the ends of the screws R R act as guides for the movements of the valves. In the lower head are screws S S, which also gage the stroke or lift of the valves G H. The lower ends of the screws S S terminate in openings or holes, in which are secured the stems of the valves G H. These holes or cavities form guides for these valves in their movements. Below these are screw-plugs S′, for the purpose of reaching the valves for adjustment, or for drawing off deposits in the cylinder and passages which may be made in the working of the apparatus, or for any purpose.

Connected with the upper head is a tank or basin, T, which is supplied with water to a point covering the tubes U, one of which is seen in Fig. 1, and at U, Fig. 4. These tubes pass down through the head, to allow the overflow of water in the basin T to be discharged into the lower basin V; and, flowing over the outside of the cylinder as it descends to the lower basin, the water is then discharged through a waste-pipe, *a′*. The lower basin surrounds the lower part of the cylinder, and the upper one the top part or head of the cylinder.

By means of these basins the upper and lower part, with the body of the cylinder, may be continually surrounded with water, which aids in cooling the same, as the nature of the case may require. The pump would become so hot by the continual action of the piston in compressing the gas, which is charged with heat taken from the water, that in forcing it out of the cylinder the pump would become inoperative if not kept cool.

The pump is mounted upon a suitable framework, and the piston-rod is provided with a cross-head and link, connecting it to the crank-shaft *b*, Figs. 1 and 2. On this shaft is the engine-crank *c*, which is so set in relation to the pump-crank *d* that the latter is in advance of the crank *c* about one-eighth of its stroke, or thereabout—that is, the crank *d* leads crank *c*. By this means the full force of the engine is exerted upon the pump when the pump-piston is at its greatest resistance and before the steam is cut off.

The steam-engine W, Fig. 2, for operating the pump, may be of the ordinary kind, with the usual devices and appendages required for the working of the pump. This pump can be, however, used as well for other aeriform gases which may be employed for the same purpose as the ammoniacal gas herein referred to, and other motors than the engine referred to may be employed for operating the pump.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. An improvement in gas-pumps for manufacturing ice, consisting of the cylinder provided with heads having tanks or water-basins, and arranged in such relation as to admit of a flow of water from one basin to the other, and to flow over the exterior surface of the cylinder in the transit of the water from one basin to the other, substantially as and for the purpose described.

2. An improvement in gas-pumps, consisting of the cylinder with heads having therein the valves, in open relation with the induction and eduction passages and water-basins

T V, arranged in said heads, with one or more outlet-pipes, U, substantially as described, and for the purpose set forth.

3. The cylinder E, surrounded at its upper and lower parts, respectively, by a water tank or basin, in combination with one or more pipes, U, in open relation with each basin, to admit the flow of water from one to the other, substantially as described, and for the purpose set forth.

4. An improvement in gas-pumps, consisting of the valves D′ F and their ports or openings, arranged within the head P of the cylinder, in combination with the guide-screws R, and induction and eduction pipes A and B, substantially as described, and for the purpose set forth.

5. In gas-pumps, an improvement consisting of the head Q, arranged to surround the lower part of the cylinder, with a water-basin forming part of said head, and having the valves G and H, with their ports or openings, within said head, and in open communication or connection with the inlet and outlet passages to and from the lower end of the cylinder, substantially as described, and for the purpose set forth.

6. The annular groove M′ and port I, arranged within the cylinder-head, in combination with the valve H, outlet B, and the piston, provided with the annular rim M, substantially as and for the purpose described.

7. In gas-pumps, an improvement consisting of a cone upon one side of the piston and the annular rim upon the other, in combination with the cylinder-heads, one having a cavity or recess to receive said cone or projection, and the other an annular groove for the reception of said rim of the piston, substantially as and for the purpose described.

8. In gas-condensing engines, one head of the cylinder having the annular groove M′, and the other a conical recess, L′, in combination with inlet-valve D′, outlet-valve H, and piston C, constructed substantially as described, and for the purpose specified.

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Witnesses:

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