

J. R. PADDACK.

STEAM VACUUM PUMP.

No. 174,972.

Patented March 21, 1876.

Fig. 1.

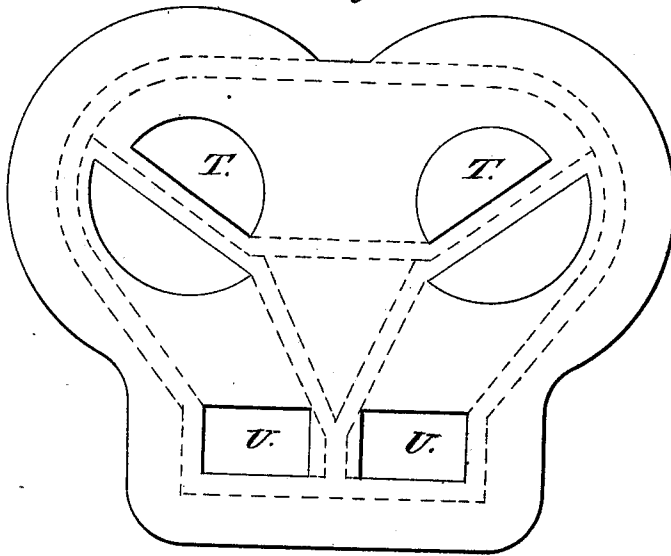
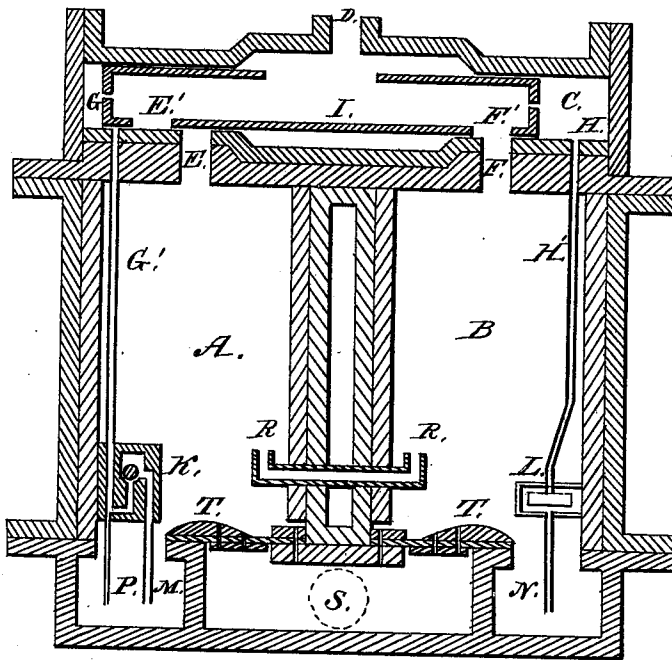


Fig. 2.



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IMPROVEMENT IN STEAM VACUUM-PUMPS.

Specification forming part of Letters Patent No. **174,972**, dated March 21, 1876; application filed November 9, 1875.

To all whom it may concern:

Be it known that I, JAMES R. PADDACK, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Steam Vacuum-Pumps, of which the following is a specification:

The object of the invention is to provide a prompt, simple, and economical method of operating the steam-valves of steam vacuum-pumps, and of securing complete condensation in the cylinders.

It consists in employing a piston or piston-valve, having equal steam-pressures supplied to its ends, in combination with separate condensing channels or chambers, in such a manner that at the proper time steam is condensed alternately from the ends of the valve alone in the separate channel or chamber, reducing the pressure and causing the valve to move and cut off the supply of steam to the cylinder from which water has just been expelled, and admit it to the cylinder which has just been filled. The cutting off from the discharging-cylinder takes place before any condensation commences in it, avoiding the great waste incident to discharging a full supply of steam into a condensing-cylinder; also, the admission of steam to the cylinder which has just been filled with water takes place before it is cut off from the discharging one, securing a constant and uniform pressure on the discharge.

Figure 1 is a plan of the base on which the cylinders and discharge-chamber are supported. It contains the seats of all the water-valves. Fig. 2 is a vertical longitudinal section through the centers of the two main cylinders and the valve-cylinder.

A and B are the main cylinders, lined with wood in the usual manner. C is the valve-cylinder or steam-chest, having the receiving-inlet D, the main steam-ports E and F, and the separate condensing-ports G and H. I is the steam-piston or piston-valve, cast hollow, and having a portion of its shell cut away in the middle to allow a constant supply of steam inside of it. It has the steam-ports E' and F', and a very small hole through each head. G' and H' are the separate condensing channels or pipes, connecting with ports G and H, and extending down to condensing-chambers K

and L, with which they connect. K and L are two different forms of condensing-chambers, either of which may be used as desired. M and N are discharge-tubes leading from the condensing-chambers to near the bottom of the main cylinders. P is a jet-tube leading from condensing-chamber K to near the bottom of cylinder A. R is a cylinder condensing-tube, extending between and connecting the two cylinders, having a nozzle opening into each. In practice I prefer running this tube down through the bottom of the cylinders and base, extending it across from one to the other on the outside, so a drain-plug may be inserted in it. S is the suction-inlet. T T the suction-valves. U U the location and passages for the discharge-valves, which are inclosed in a hood or chamber having an outlet for connection with the discharge-pipe.

The operation is as follows: The cylinders A and B being filled with water, and the steam-valve I in position, as shown in Fig. 2, steam is turned on, when it passes through steam-ports F' and F into cylinder B, expelling the water by its pressure through the discharge. At the same time steam from the right end of valve-cylinder C, supplied through the small hole in the end of the valve, passes through port H and down channel H', expelling the water in it through condensing-chamber and discharge-tube. The water in the cylinder and the channel having the same steam-pressure on top, and a common discharge-pressure, will maintain the same level while being discharged. When the water in the channel has been forced down as far as the condensing-chamber, and takes the upward turn there through the perforated top, the steam comes under it, and is rapidly condensed, reducing the pressure in the channel and right end of valve-cylinder, when the valve shoots from left to right, closing ports F and H and opening E and G. The supply of steam being thus transferred from cylinder B to cylinder A, the steam-pressure and weight of the water in A exceeding the pressure of the steam remaining in B, a jet of water is forced through tube R into cylinder B, completely condensing the steam there, producing the vacuum required to enable it to fill with water through the suction-pipe. By the time

it has filled, water will have been forced down channel G' to condensing-chamber K, and taking the upward turn in it, steam will follow, and come under it and be condensed, when the pressure there will be reduced, and the small ball-valve will close, cutting off any return pressure at that point, and a strong jet of water will be forced through jet-tube P straight up into channel G', completely condensing the steam, relieving the pressure there and in the left end of valve-cylinder C, causing the valve to shoot from right to left, as it did before from left to right, and so on continuously.

Two different forms of condensing-chambers are shown, so as to illustrate and explain both. Either may be used at pleasure, or the siphon-shaped chamber may be used without a valve, or the valve may be placed at the lower end of the discharge-tube without change of the characteristic feature of this part of the invention. When used without the valve, it will take longer to effect sufficient condensation to insure the throw of the steam-valve.

The condensing channels and chambers may be placed outside the main cylinders, or part outside and part inside, if desired.

A slide-valve may be used to control the admission of steam to the cylinder, if preferred, by being connected and moving with a piston operated as just described.

By the combination of condensing-tube R with the two cylinders A and B and their water-valves, either cylinder may be made to fill and discharge, operating continuously, without the intervention of a steam-valve.

The operation of this combination is as follows: A is supplied with steam through a pipe of the size ordinarily used. B is supplied through a very small nozzle—say, one-sixteenth of an inch. A is filled with water, and steam is turned onto both. While water is being expelled from A, a portion of it will be forced through tube R, filling cylinder B above the level of the tube.

When steam comes under the water, by following it into the upward turn in the discharge it is partially condensed, and the pressure in cylinder A reduced. The undiminished pressure in B then forces a condensing-jet through tube R back into tube A, and condenses the steam there as fast as it is supplied, maintaining a vacuum that enables A to fill with water through the suction, until the head, to which it has filled, is sufficient to overpower the head of the jet, when the steam-pressure accumulates, again expelling the water from A, and at the same time forcing a jet into B, storing up a supply there for its own condensation at the proper time. In operating

in this way, quite a small cylinder could be used as condensing-cylinder instead of B.

The employment, in steam-vacuum pumps, and direct-acting steam-piston pumps, of pistons and piston-valves, having equal steam-pressures supplied to their heads, and the throwing these valves, by exhausting or condensing the steam from their heads alternately, is not new. Valves of this kind have been used in different steam-vacuum pumps.

In one of them, the ends of the valve-cylinder communicate directly with the top of the main cylinder. In another the ends of the valve-cylinder communicate with the top of the main cylinders, indirectly, through the steam-ports. Both require a strong condensation in the main cylinder, while a full supply of steam is pouring into them, before the steam-valve can be thrown, involving a great waste of steam, and a delay in the throw of the valve, which gives a broken discharge, causing an annoying and injurious ramming and concussion in the discharge-pipe.

The distinctive feature of this part of my invention consists in throwing the steam-valve or piston, by condensing the steam from its end alone, and in a separate channel or chamber, and in throwing it and cutting off steam from the main cylinders, before any condensation commences in them, avoiding the great waste inseparable from discharging a full supply of steam into a condensing-cylinder, and securing a uniform discharge-pressure.

The distinctive feature of that part of my invention which relates to condensing steam in the main cylinders consists in employing a condensing-tube extending between the cylinders, and connecting them near the bottom, having a nozzle opening upward in each, so the steam-pressure and water in one cylinder can be used to condense the steam in the other.

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

1. The combination, with piston-valve I, valve-cylinder C, ports G and H, of channels or tubes G' M O H' N, and condensing-chamber K and L, arranged substantially as specified.

2. The combination, with cylinders A and B, of condensing-tube R, arranged substantially as specified.

3. The condensing-chamber K, in combination with piston-valve I and valve-cylinder C, arranged substantially as described.

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Witnesses:

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