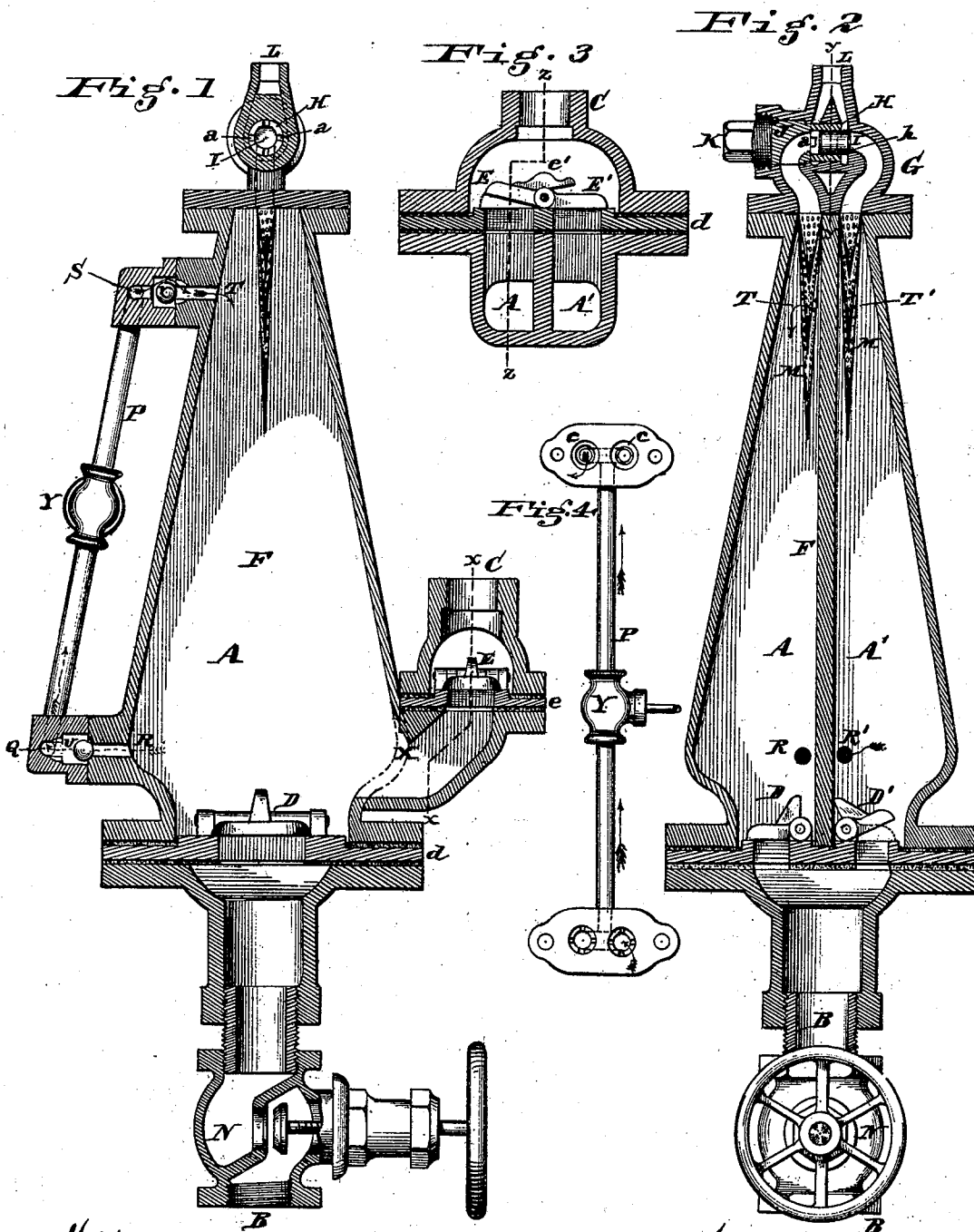


B. C. VANDUZEN.
STEAM AND VACUUM PUMP.

No. 171,886.

Patented Jan. 4, 1876.



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UNITED STATES PATENT OFFICE.

BENJAMIN C. VANDUZEN, OF CINCINNATI, OHIO.

IMPROVEMENT IN STEAM AND VACUUM PUMPS.

Specification forming part of Letters Patent No. 171,886, dated January 4, 1876; application filed October 13, 1875.

To all whom it may concern:

Be it known that I, BENJAMIN C. VANDUZEN, of Cincinnati, Hamilton county, State of Ohio, have invented an Improvement in Direct Steam Vacuum-Pumps, of which the following is a specification:

My invention consists, first, in the combination, with the receiving-chambers, of perforated screens to check the upward throw of the water, and so heat the water as that but little, if any, condensation will take place when the steam strikes the water; second, in the peculiar construction of steam-valves for governing the admission of steam to the two vessels alternately, by which the movement is rendered very sensitive and positive in operation; third, in the combination, with the two forcing-vessels, of a side pipe, passages, and valves operating to automatically convey injection-water to the top of each side of the pump alternately, to assist condensation and facilitate the regular movement of the pump without the necessity of an air-vessel; fourth, in the provision of a regulating-valve in the side pipe for determining the admission of injection-water to the vessels, and thereby regulating the speed of the pump.

Figure 1 is a vertical section parallel with the diaphragm which divides the pumping-vessels, the section at the discharge-valves, being taken on line Z Z of Fig. 3. Fig. 2 is a vertical section across the dividing-diaphragm. Fig. 3 is a cross-section of the discharge-valve chamber on line X X of Fig. 1. Fig. 4 is an elevation of the side pipe.

A A' are the two chambers, into and from which the water is alternately received and discharged. B is the supply-pipe, and C the discharge-pipe. D D' are the receiving-valves, and E E' the discharge-valves. The discharge-valves E E' are hinged to ears cast upon the valve-seat plate *e*, in the ordinary way, and stop upward against the guard *e'*, and the reception-valves are hinged to ears upon the plate *d*, and stop upward against the diaphragm F, which divides the chambers A A'. G is a valve-chamber, secured by flange-connection, as shown, to the top of the chambers A A'. It is bored to snugly receive the sleeve H of the valve I, which seats at one end against a seat, *h*, in the case or chamber, and at the other end on the plug J, which is cored

as shown, fitted snugly in the chamber and held by cap K. The chamber G is cored, as shown, to communicate from a single steam-pipe, L, with the chambers A A' separately, the passage being governed by the respective ends of the valve I in motion. Owing to the provision of the sleeve H the valve is moved with but little force, and although my pump has but very little ramming effect of the water in completing its entry into the water-chambers, that little is amply sufficient to move the valve promptly, and this force is depended upon to move it. The steam which drives out the water is passed through slits or notches *a* at each end of the sleeve, and these notches are made so small as to admit only sufficient steam to work the pump, and not sufficient to press the valve I forcibly to its seat.

The action of this valve and sleeve is as follows: When the water is being received in chamber A it, in completing its motion inward, rams slightly against the valve I at this end, and causes it to seat at the opposite end, thus turning steam on the full water-chamber and cutting it off from the chamber A', which is then ready to condense and receive. The effect of this sudden throw of the valve is the lessening of pressure of steam on the unseated end of the sleeve H and a concussive increase in the slits of the other end sufficient to cause the sleeve to be thrown over, so as to govern through its slits the admission of steam to the full water-chamber. Between the chamber G and the separate chamber A A' conical screens M are provided, preferably of perforated copper, and in sets of two or three, so that the water will have to pass through more than one. The purpose of these screens is to retain, as much as possible, the temperature of the steam to check the water as it reaches the top of the vessel, and, while thus retarding its velocity and checking its ramming tendency, to heat it, so that when steam is admitted to it there will be but little condensation. I introduce a valve, N, in the suction-pipe B to permit the operator to so regulate the admission of water to the pump as to govern thereby the speed of the pump and regulate the amount of ramming action of the water upon the valve I. P is a side pipe communicating through cross-passage Q and holes R R' with

the bottom of chambers A A', and by cross-passage S and holes T T' with the top of chambers A A'. In the passages R R' ball-valves U seat inward and prevent the flow of water into the vacuum side at the bottom of the pump while permitting the flow of water outward into the top of vacuum-chamber, and in the cross-passage S ball-valves V seat outward for admitting injection-water to the vacuum side of the pump while preventing the escape of steam from the delivery or forcing side. The valves V are in separate pockets c c, Fig. 4, the cross-passage S forming the only communication, and similar separate pockets are afforded for valves U. By the use of the side pipe and valves the water on the discharging side of the pump is automatically injected into the vacuum side, so as to condense the vapor in the side ready to receive water and cause the prompt inflow of water, whether the vacuum has been commenced to be formed by the escape of steam past point X or not. Thus, upon every failure of the water from any cause to go below point X, so as to permit the escape of steam, the automatic injection promptly effects condensation and the reversal of the valves of the pump, and renders the strokes uniform. I provide a valve, Y, in pipe P to

regulate the amount of injection, and by this means to also govern the pulsations of the pump.

I claim—

1. The combination, substantially as specified, of the water-chambers, the steam-chest, and the conical screens, which wholly cover the ports between the steam-chest and the respective water-chambers, and depend into the latter.

2. The combination of chamber G, sleeve H a, and valve I, constructed and operating substantially as and for the purpose specified.

3. In combination with the chambers A A' the side pipe P and valves U U V V, connected and operating substantially as and for the purpose specified.

4. In combination with the chambers A A', side pipe P, and valves U V, the governing-valve Y, operating substantially as and for the purpose specified.

In testimony of which invention I hereunto set my hand.

BENJAMIN C. VANDUZEN.

Witnesses:

EDGAR J. GROSS,
JOHN E. JONES.