2 Sheets—Sheet 1.

H. W. BEINS.

Steam-Trap.

No. 209,601. Patented Nov. 5, 1878.

Fig. 1

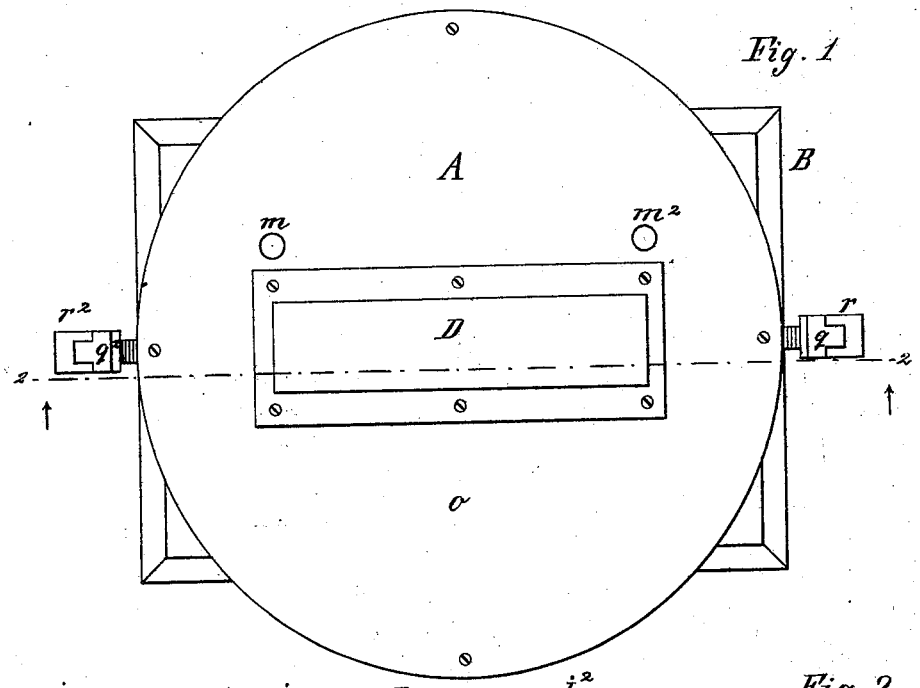
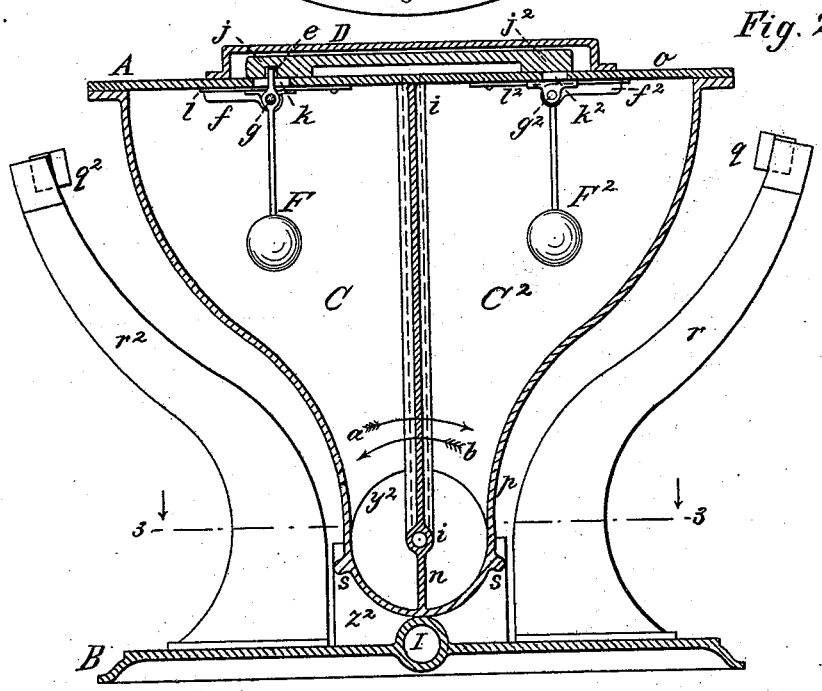


Fig. 2



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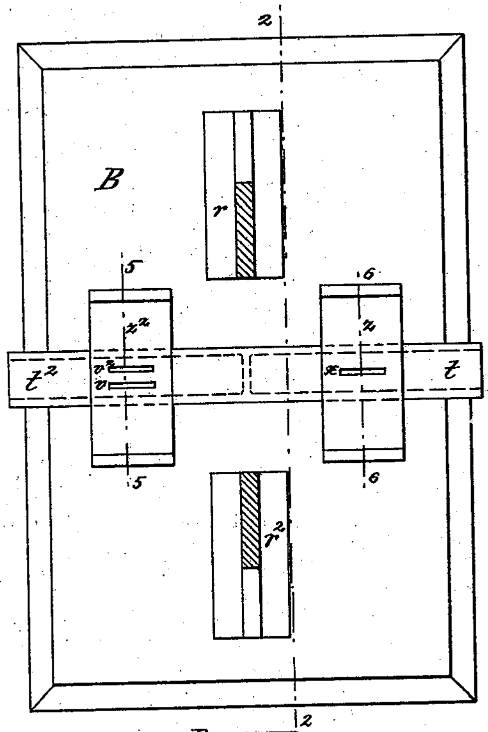


Fig. 3

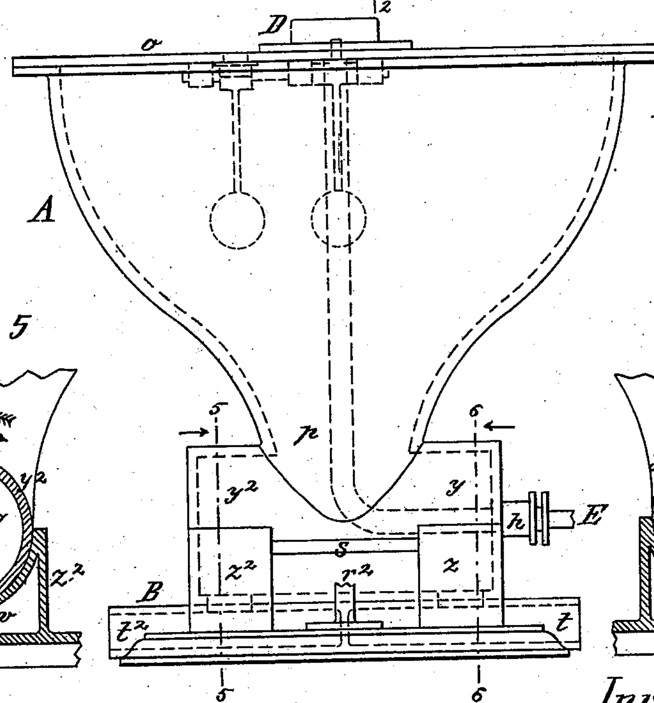


Fig. 4

Fig. 5

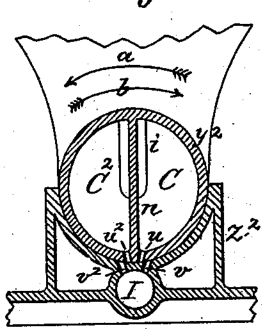
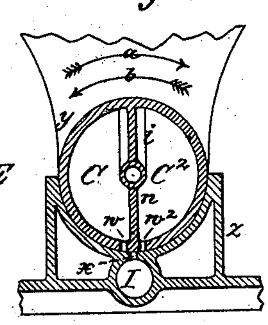


Fig. 6



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UNITED STATES PATENT OFFICE.

HENRY W. BEINS, OF NEW YORK, N. Y.

IMPROVEMENT IN STEAM-TRAPS.

Specification forming part of Letters Patent No. **209,601**, dated November 5, 1878; application filed December 22, 1877.

To all whom it may concern:

Be it known that I, HENRY W. BEINS, of the city and county of New York, in the State of New York, have invented a new and useful Improvement in Steam-Pumps, of which the following is a full, clear, and exact specification.

The subject-matter of this invention is a simple automatic apparatus primarily designed for trapping water out of steam-pipes, but also adapted to be employed as a feed-water injector for steam-boilers or as a vacuum water-elevator.

Oscillating water-vessels have been made use of, both as steam-pumps and steam-traps, the water running into first one chamber and then the other of the oscillating vessel, and by its weight moving the vessel, and the valves or cocks have been changed to cause the vessels to be emptied alternately by the action of steam-pressure.

My improvement relates to the construction of the oscillating vessel and the valves and connections thereof for water and steam, respectively, as hereinafter more fully described, whereby the two chambers above the trunnions are alternately filled and discharged, and the leverage of the full chamber increases as the parts move, so that risk of an incomplete movement of the parts is avoided.

Figure 1 of the accompanying drawing is a plan view of a steam-trap illustrating this invention. Fig. 2 is a vertical section on the line 2 2, Fig. 1. Fig. 3 is a plan view of the base, with its guard-arms in section on the line 3 3, Fig. 2. Fig. 4 is a side elevation or edge view of the apparatus, with the near guard-arm broken off to expose parts behind. Figs. 5 and 6 are vertical sections through the inlet and outlet ports on the line 5 6, Fig. 4.

Like letters of reference indicate corresponding parts in the several figures.

This improved steam-trap consists of an oscillating vessel, A, and a stationary base, B, with attached parts. Said base is constructed with two similar bearings, $z\,z^2$, fitted to a pair of horizontal trunnions, $y\,y^2$, at the bottom of the vessel A; and said bearings and trunnions are provided with inlet-ports $x\,w\,w^2$ and outlet-ports $v\,v^2$ and $u\,u^2$. The ports in the bearings communicate with a pair of tubular chambers, I O, in the base, terminating in necks $t\,t^2$, and said neck t of the inlet-chamber I receives the trap end of a steam-pipe. (Not shown.) A discharge pipe (not shown) leads from the outlet-neck t^2. A single central inlet-port in the bearing z operates in combination with a matching pair in the trunnion y, and the two outlet-ports in the trunnion y^2 operate in combination with two wider apart in the bearing z^2. This arrangement insures the simultaneous opening of an inlet-port and an outlet-port on opposite sides of the axis of the trunnions at each oscillation of the vessel. Lateral ribs $s\,s$, on the lower part of the vessel A, between the bearings $z\,z^2$, prevent the displacement of the trunnions longitudinally, and suitable caps (not shown) may be applied to the bearings to hold the trunnions down in their seats. A pair of guard-arms, $r\,r^2$, project outward and upward from the base B to points equidistant from the vertical and horizontal planes of the axis of the trunnions $y\,y^2$, and said arms are provided at their extremities with rubber cushions $q\,q^2$. These arms, with their cushions, limit the extent of the oscillating motion of the vessel A, and support said vessel in its respective inclined positions. Held in the central position in which it is shown, said vessel is inoperative, all the said water-ports being closed, and said vessel is so held to stop the operation at any time.

The vessel A is constructed with a narrow central waist, p, immediately above the trunnions $y\,y^2$, and with a wide concentric upper end, closed by a circular top plate, o. From this top plate to the bottom of the vessel, in line with the axis of its trunnions, a central partition, n, extends from front to rear, dividing the interior of said vessel into two water-chambers, C C^2, of equal capacity, and of equal extent laterally from the said central partition, which is in line with the axis of the trunnions. One of the inlet-ports $w\,w^2$ and one of the outlet-ports $u\,u^2$ are located in the bottom of each water-chamber.

A pair of air-vents, $m\,m^2$, are provided in the top plate, o, in communication with the chambers C C^2, respectively, and these vents are guarded by internal flap-valves $l\,l^2$, attached to the bottom of said top plate. A pair of steam-ports, $k\,k^2$, are also provided in

said top plate, in communication with the respective chambers C C^2 at top; and valve-seats (one or more) are planed around these ports, on the upper surface of said top plate, to receive a slide-valve, or connected pair of slide-valves, j j^2, which cover both of said ports when the vessel A is in central position, as illustrated in Fig. 2. A valve-chest, D, attached to the top plate, o, covers said steam-valves. Steam may be admitted to the interior of this steam-chest in any preferred way. In the illustration, a steam-passage, i, extends inward through the front trunnion, y, in line with the axis of the trunnions, and consequently in line with the partition n, and thence upward, within said partition, to and through the top-plate, o; and a swivel stuffing-box, h, Fig. 4, at the outer extremity of said passage, makes provision for readily attaching a small steam-pipe, E.

Within the said chambers C C^2, respectively, a pair of pendulums, F F^2, are suspended, by pivots or pivotal shafts g g^2, parallel to said axis of the trunnions, and between the partition n and the respective air-vents, said pivots working freely in bearings attached to the bottom of the top plate, o. The pivotal shaft g of said pendulum F and the upper end of said pendulum F^2 are provided with horizontal arms f f^2, which extend beneath and are attached to the vent-valves l l^2, so that both of said valves are closed when the vessel A is in central position, as illustrated. Provision is made, in customary manner, for a slight independent motion of said arms with reference to said valves l l^2, so that neither vent shall be opened while the steam-port of the same chamber is open. A finger, e, forming a vertical extension of said pendulum F, projects through the steam-port k, or an extension thereof, into a socket in the bottom of the slide-valve j, which socket is in line with the shank of said pendulum in said central position of the parts. The steam-valve k^2 is connected to said valve k, so as to partake of the motions of the latter.

In operation, the inlet-chamber I is full of water, seeking an outlet, and steam-pressure is maintained within the valve-chest D. The vessel A is now turned against the cushion q of the arm r, for example. This motion (indicated by arrows a in Figs. 2, 5, and 6) brings the inlet-port w, at the bottom of the water-chamber C, into communication with the inlet-port x of the base B, and the outlet-port u, at the bottom of the chamber C^2, into communication with the outlet-port v of the base. The same motion as transmitted by the pendulums F F^2 and their arms and finger f f^2 e opens the air-vent m at the top of said chamber C, and the steam-port k^2 at the top of the chamber C^2. Any water in the latter is therefore quickly discharged through said outlet-ports u^2 v^2, the outlet-chamber O, and neck t^2. Meanwhile water is flowing into said chamber C through the neck t, chamber I, and ports x w, and air is escaping before it through the vent m. When the body of water thus admitted, extending outward from the central partition, n, causes the filled side of the vessel to overbalance that portion of said vessel and its appurtenances on the opposite side of the vertical plane of the axis of the trunnions of said vessel, the latter, being free to oscillate on said trunnions, will so oscillate, as indicated by the arrows b. The cushion q^2 of the guard-arm r^2 now arrests and supports the vessel A. Water enters the chamber C^2 through the ports x w^2, and escapes from the chamber C through the ports u v. Steam enters the top of said chamber C, and air escapes from the top of said chamber C^2.

Thus the operation continues automatically as long as there is water enough to fill one of said chambers C C^2, the respective chambers being filled and emptied alternately. If steam should break through the water in the bottom of the filling-chamber it can simply escape freely through the vent, and cannot otherwise affect the operation of the apparatus, which is controlled by the gravity of its contents.

Owing to the said provision for discharging the water under steam-pressure, the apparatus is adapted to be employed as a feed-water injector without other modifications than changes of form and proportions to suit taste and circumstances.

The apparatus, with very slight modifications, is also adapted to be employed as a vacuum water-elevator. In this case the operation of the air-vents would be reversed, and provision would be made for admitting cold spray, or its equivalent, into the top of the receiving-chamber to condense the steam, and the steam-valves would also require to be timed differently.

The shape of the vessel A and the shape and arrangement of other parts may be changed at pleasure, so long as the operation above specified is not materially departed from. The circular shape of said vessel is unessential, for example, and other known forms of valves may be employed as substitutes for the flap-valves l l^2 and slide-valves j j^2.

The following is what I claim as new and of my own invention, and desire to secure by Letters Patent of the United States, namely:

1. The oscillating vessel a, constructed with a narrow central waist, p, and with a wide upper end, so that the two water-chambers are largest at the upper end, in combination with the inlet and outlet water and steam ports and the base B and the guard-arms and cushions, substantially as and for the purposes set forth.

2. An oscillating vessel having a pair of equal water-chambers on the respective sides of its axis, and adapted to receive and discharge water at its bottom, as aforesaid, in combination with pendulums within the respective chambers of said vessel for opening and closing air-vents in the tops of said cham-

bers, said vents being automatically opened simultaneously with the opening of the inlet-water ports of the respective chambers.

3. The combination of a pair of pendulums, a pair of vent-valves, operated by said pendulums, and a steam-valve, operated by one of said pendulums, with an oscilling vessel having a pair of trunnions at bottom, provided, respectively, with inlet and outlet water-ports, a central partition forming two equal water-chambers on the respective sides of the axis of said trunnions, and a top plate provided with a pair of air-vents and a pair of steam-ports for the said water-chambers, said valves being applied, respectively, to said air-vents and steam-ports, said steam-valve inclosed in a steam-chest, the axes of said pendulums parallel to the axis of said trunnions, said trunnions seated in bearings having water-ports, and said vessel arrested in its respective inclined positions by guard-arms, substantially as hereinbefore specified.

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