E. W. ELLSWORTH.

WATER RAM.

No. 4,296. Patented Dec 6, 1845.

Fig: 1.

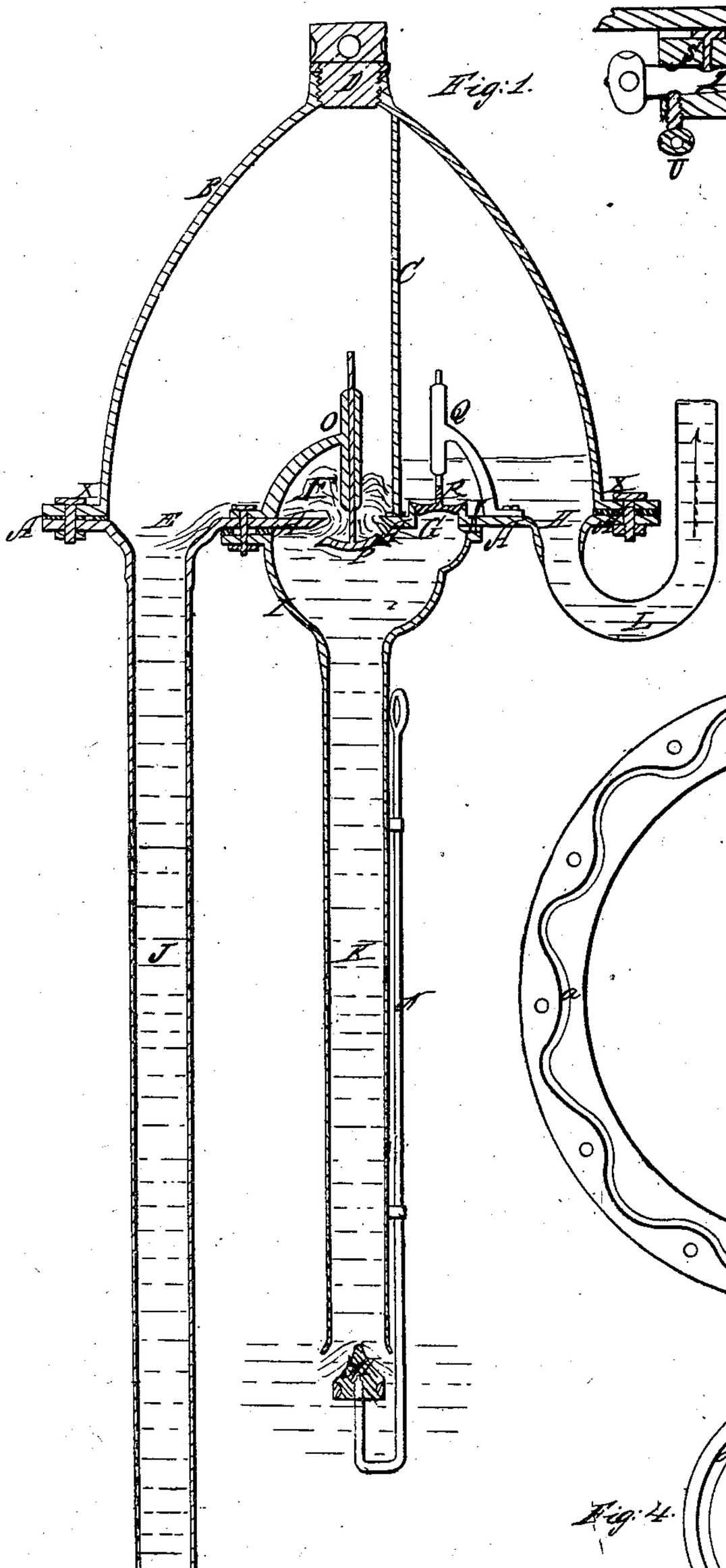


Fig: 2.

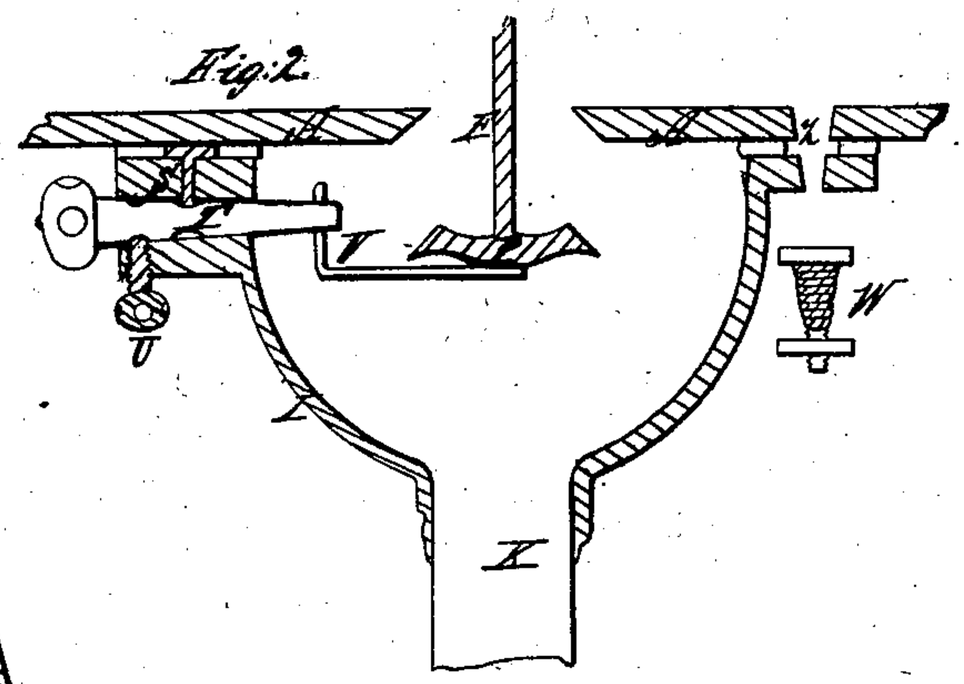


Fig: 3.

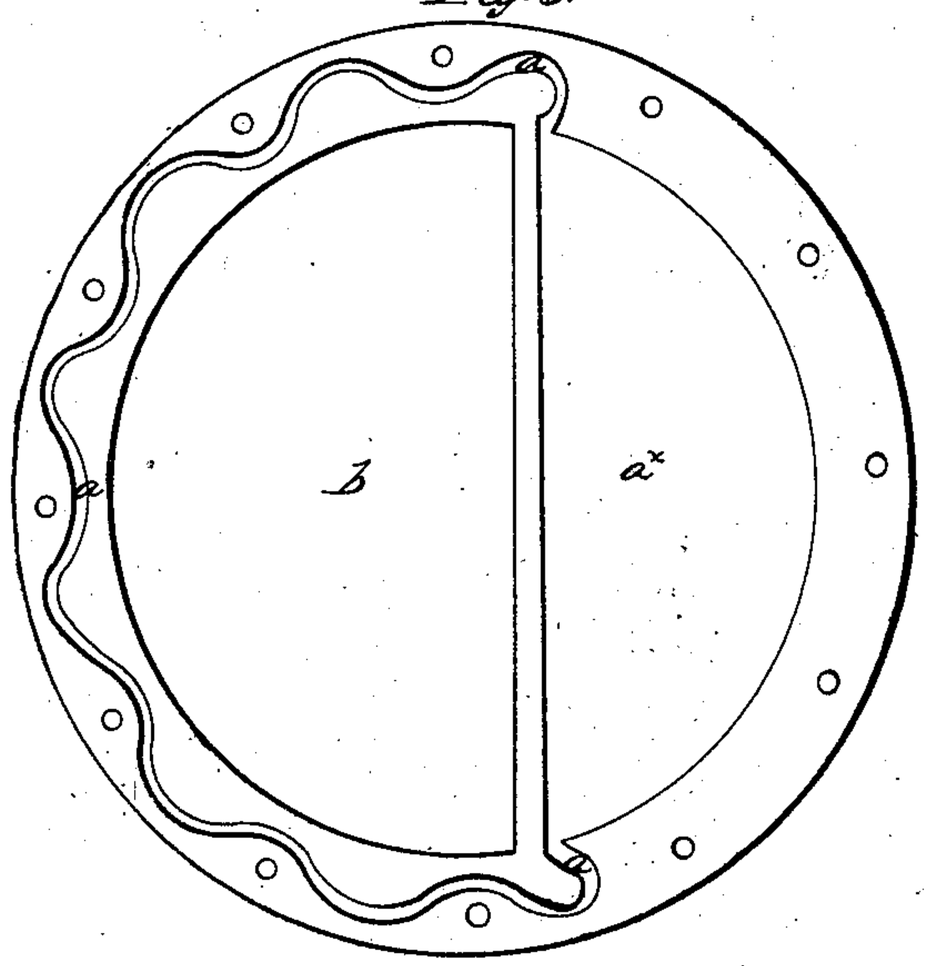
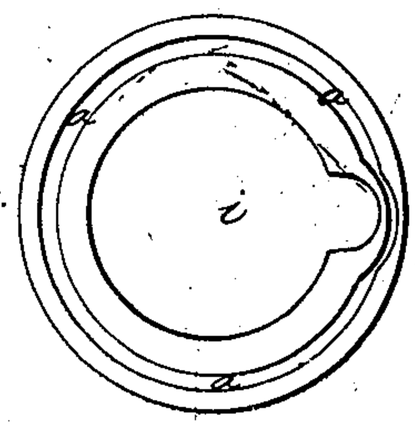


Fig: 4.



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UNITED STATES PATENT OFFICE.

ERASTUS W. ELLSWORTH, OF SOUTH WINDSOR, CONNECTICUT.

WATER-RAM.

Specification of Letters Patent No. 4,296, dated December 6, 1845.

To all whom it may concern:

Be it known that I, ERASTUS WOLCOTT ELLSWORTH, of South Windsor, in the county of Hartford and State of Connecticut, have invented an Improved Mode of Elevating Water; and I do hereby declare that the following is a full and exact description.

My invention consists in a peculiar manner of working the water-ram of Montgolfier, in combination with the siphon, by the use of a chamber of rarefied air; also in the use of water packing for excluding the external air from the siphon, and in the fixtures herein described for setting in motion and regulating the action of the ram.

To enable others, skilled in the art, to make and use my invention I will proceed to describe its construction and operation.

In the accompanying drawings Fig. 1, is a section of the whole machine (with the exception of the regulator) where it, is a circular plate, through which are four circular openings, E, F, G, H. To the upper surface of this plate is secured by a flange, bolts, and packing, the hollow dome B. In this dome is an air-tight partition C, which comes down to the plate A, where it bears upon packing, like the flange of the dome. This partition passes between the holes F, and G. To the under surface of it, is secured in the same manner as the dome, the cup I which communicates freely with apertures F, and G. This cup forms the head of the ram and the apertures F, and G, the seats of the valves—the escape or waste valve opening at F, downward into the cup I, and the retaining or lifting valve, opening at G, upward into the smaller cavity of the dome which acts as the air-vessel of the ram. These valves have stems rising from their centers which pass through the tubular guides O, Q. From I proceeds the pipe K, which constitutes both the body or trunk of the ram, and the shorter leg of a siphon. The machine thus embodies the hydraulic ram of Montgolfier, the several parts of which are as follows: K, the trunk of the ram, I, the head, P, the escape valve, R, the lifting valve, C, the air-vessel H, L, the discharging pipe; these parts are designed to operate precisely as in Montgolfier's machine and therefore need no further explanation.

From the orifice E, proceeds the pipe J, the longer leg of a siphon of which K, is the shorter, as before said.

M, is a piston or plug fitted loosely to the bore of the pipe K, and attached to the recurved rod N, passing through loops on the pipe K, by which it can be drawn up a short distance into, or thrust down entirely out of K.

D, is a screw-plug faced with a collar of packing, through which water may be poured into the larger cavity of the dome, and consequently into both legs of the siphon.

The operation of the machine is as follows: M, is drawn up into K, and J, and K, are filled, and the larger cavity of the dome half, or two-thirds filled with water, through D. D, is then replaced. As soon as D, is replaced the air in the larger cavity of the dome will be rarefied by the weight of the column of water in J, more or less, in proportion to the perpendicular height of the column. Let M, by means of N, be thrust down out of K; this will open the valve P, (if it be shut) and the ram will commence operating, owing to the preponderance of the column of water in J, over that in K.

The use of the body of rarefied air in B (which is a prominent and novel feature in my invention) is analogous to that of the compressed air in the air-vessel C. The water in K, has a reciprocating movement which makes the current through the valves intermittent, and the water enters the two cavities of the dome by pulses, and not in a constant stream. But for the same reasons that it is desirable that the water should pass through the discharging pipe H, L, in a steady current it is also desirable that the escape-water should flow down the longer leg of the syphon in a steady current—namely, that water passes through a pipe, (especially if it be of considerable length) much faster and with far less resistance from friction and inertia, when flowing with a uniform velocity than when checked and impelled intermittently. Moreover as above stated, the water in K, reciprocates; a movement upward is followed by a recoil downward; now without the interposition of the chamber of rarefied air this movement must be communicated to the water in J, from

that in K, or the ram cannot operate. The column in J, must advance and recoil just as far and as often as in K. But this peculiar movement is of no use in J, nay, is exceedingly injurious, for if J, be many rods, or even feet, in length, said movement will consume the effective power of the machine so completely as to stop it.

It is obvious that an equilibrium never can be restored between the chamber of rarefied air and the water in K, inasmuch as the column J, acts as a steady exhausting power, and will always remove the water from the chamber above it at a uniform rate which will be the mean of that at which it enters the chamber from the escape-valve of the ram. Finally—the air inclosed in B, differs from that inclosed in C, only as a spring under tension differs from a spring under pressure, and both bodies of air, by their elasticity are made to convert an intermittent flow of water into a uniform and constant stream.

A peculiarity in my method of packing this machine, and the fixture by which I regulate the action of the ram (both of which I claim as my invention) remain to be described. The packing which I place beneath the flanges of the dome and cup, I make of leather or any other suitable material. It is represented at Figs. 3, and 4. That part of it in Fig. 3 which lies between the vacuum chamber of the dome, and the external air, and the whole of Fig. 4, are divided through their thickness by a channel, which channels are both supplied with water under pressure from the air vessel of the ram. In Fig. 3, the communication between this channel and the air vessel is obvious; with the channel in the packing of the cup it is made through the hole Y, as shown at Fig. 1. The bolts of I, pass through the channel in the packing and are wound with thread conically, and fitted into conical holes as shown at W, Z, Fig. 2.

My regulator (not represented in Fig. 1, as a section of it would be at right angles with the section of said figure) is shown on an enlarged scale in Fig. 2, the lettering of which corresponds to that of Fig. 1. Under the flange of the cup I, is a square block of metal through which passes a horizontal axle T, ground into its place like a common stop-cock. This axle carries, within the cup, a small crank V, which acts as a cam beneath the valve P, permitting it to drop to a greater or less distance from its seat, F. Around that part of the axle which is within the block are cut two grooves, one of which receives the water-packing from the channel above, through the hole S, and the other takes a screw U, from beneath, which clamps the axle in any required position. The advantages of this regulator are that by turning the axle T, at any time when the machine is in operation, the amount of water which it expends and also which it elevates may be regulated with precision according to any increase or diminution of the supply at the lower end of K, or to the quantity required to be delivered through the pipe H, L. By it P, may also be completely closed, so as to stop the action of the machine entirely.

In order to supply the air vessel of the ram with air, and also to remove from the vacuum chamber any surplus air which may be liberated from the water in passing through it, as much of the plate A, lying under said chamber as the flanges of B, and I, will permit is sunk below the general level of said plate, which drains off the water quickly from the vicinity of F. Consequently after said chamber becomes completely filled with rarefied air, each recoil of the ram draws a small portion of it down through F, which lodges under G, and is forced into the air-vessel of the ram by the next blow.

This apparatus I contemplate applying in all situations where it is desired to elevate water by water-power, and also to springs and wells, wherever the operation of a siphon is practicable. I consider it in some points superior to the common hydraulic ram, inasmuch as the working apparatus, instead of being placed at the foot of the head of water which furnishes the moving power, is located above it, where it can never be immersed in back-water, and is conveniently situated for repair or regulation.

I consider it much superior in efficiency to other methods hitherto proposed for discharging liquids from the curve of the siphon, and as having unquestionable and very great advantages over the combination of the siphon and the water-ram devised by Hachette, inasmuch as I use the best form of the water-ram—that invented by Montgolfier, in which the escape and lifting valves act alternately, and are not connected with each other as in Hachette's machine—also in using a chamber of rarefied air in the manner herein described, for allowing the escape-water of the ram to pass down the longer leg of the siphon in a continuous stream, (instead of permitting it to receive the oscillating movement of the ram) whereby the loss of power from inertia and the friction of the water in the pipe is greatly diminished—also in having fixtures for filling, starting, stopping, and regulating the action of the engine, that can be reached and controlled near the head of the ram, which conveniences are either wanting in Hachette's machine or are situated unhandily at the extremities of the siphon.

What I claim as of my invention and desire to secure by Letters-Patent consists in—

A peculiar manner of working the water-

ram, in combination with the siphon, by the use of a chamber of rarefied air, for the purpose of causing the escape-water to flow down the longer leg of the siphon in a continuous stream; also in the use of channels in the packing of the joints, supplied with water from the air-vessel of the ram, for the purpose of excluding completely, and with certainty, the external air from the siphon; also in the fixtures herein described for setting in motion and regulating the quantity of water consumed by the ram.

ERASTUS W. ELLSWORTH.

In presence of—

JESSE CHARLTON,

ERASTUS ELLSWORTH.