(No Model.) 2 Sheets—Sheet 1.

J. BURNS.

Steam Trap.

No. 230,233. Patented July 20, 1880.

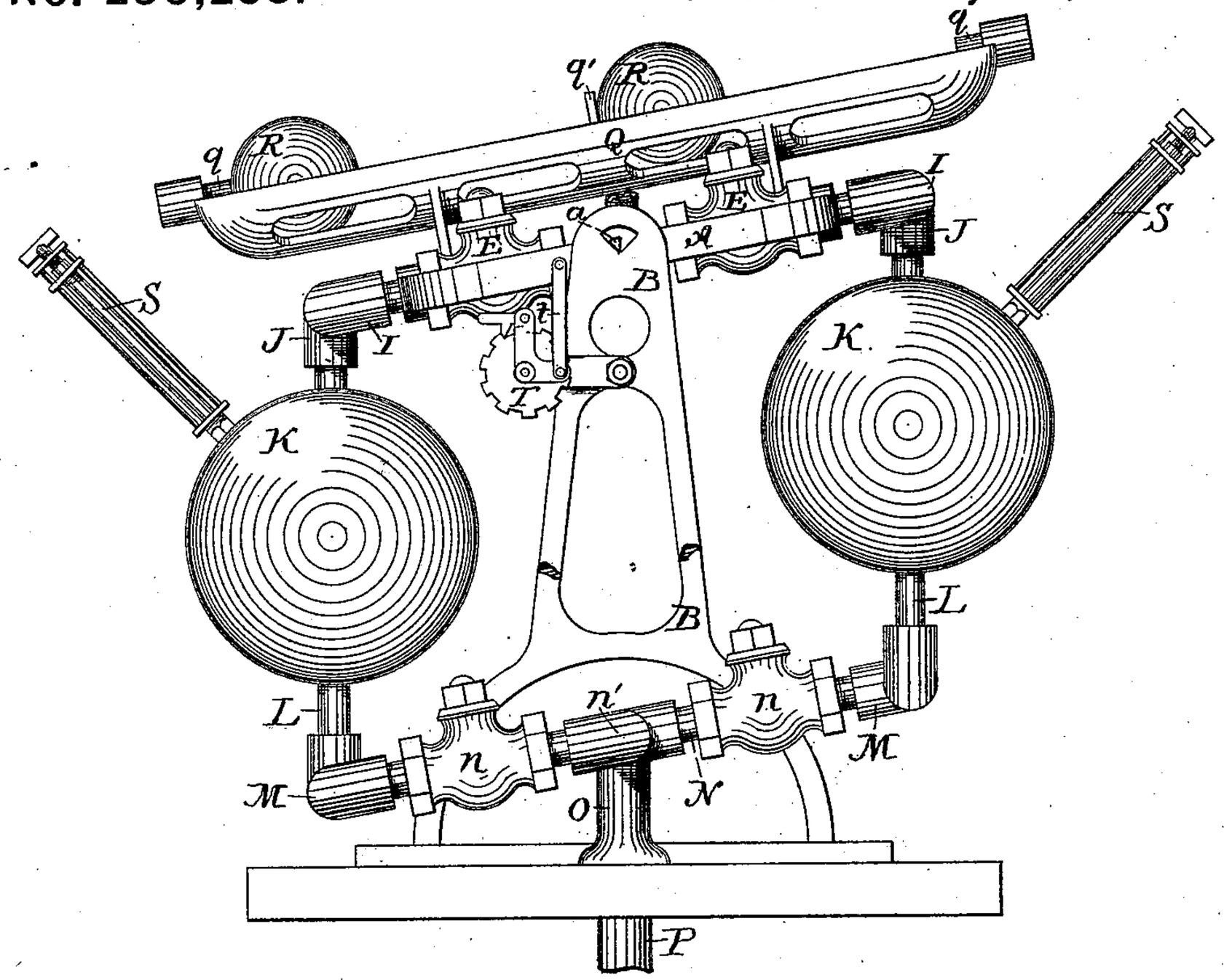

FIG. 1.

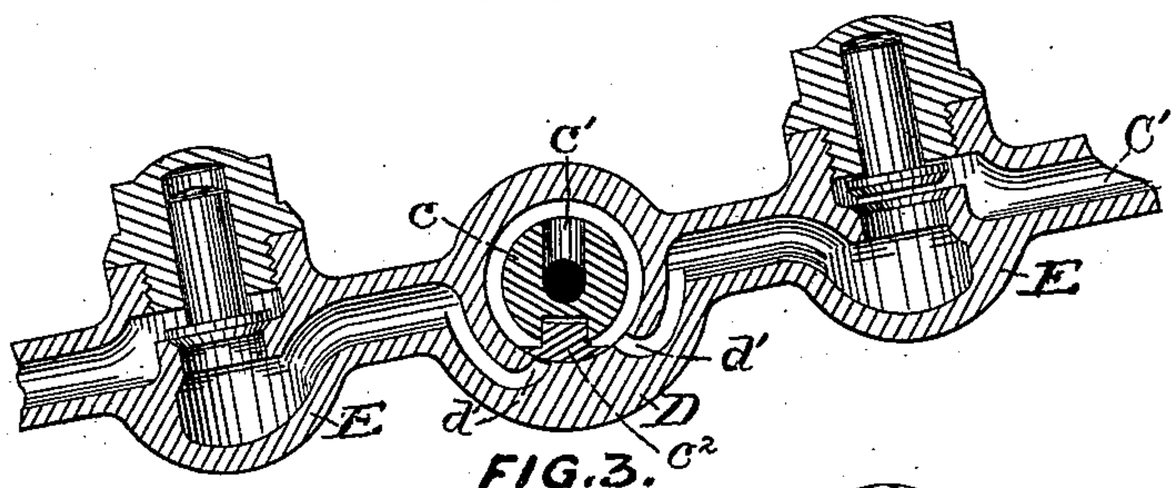

FIG. 3.

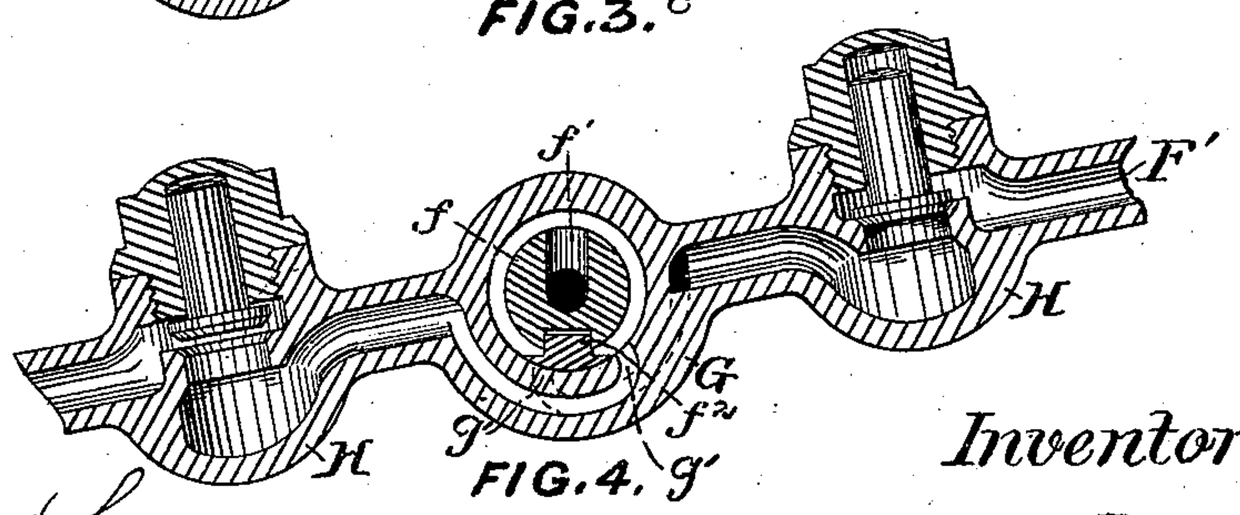

FIG. 4.

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Inventor:

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Attorney

(No Model.) 2 Sheets—Sheet 2.

J. BURNS.

Steam Trap.

No. 230,233. Patented July 20, 1880.

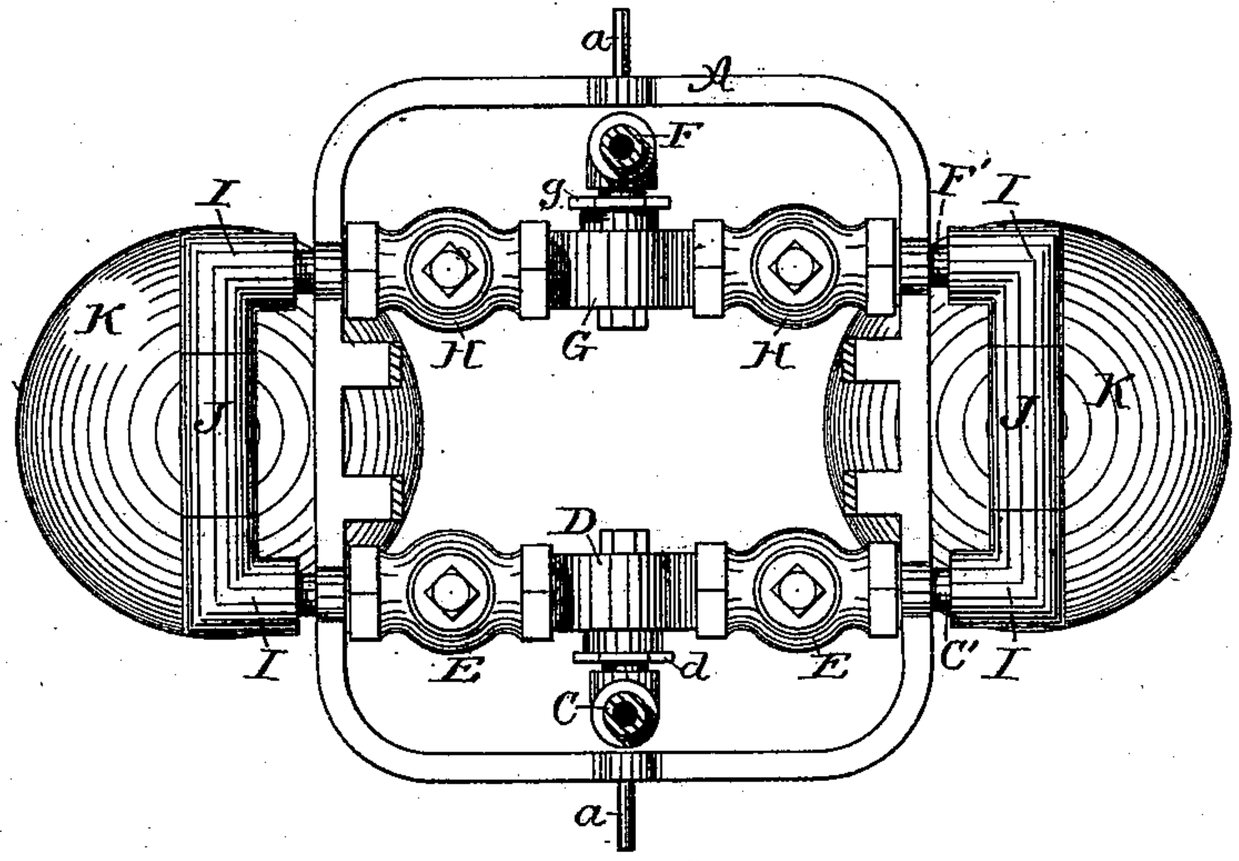

FIG. 2.

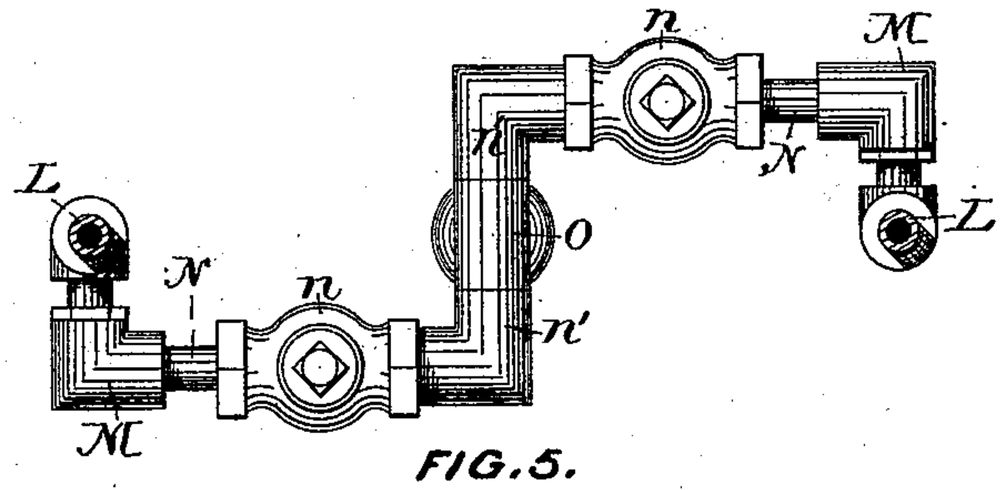

FIG. 5.

Witnesses:

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UNITED STATES PATENT OFFICE.

JOHN BURNS, OF TROY, NEW YORK, ASSIGNOR OF ONE-HALF OF HIS RIGHT TO THEODORE E. HASLEHURST, JESSE B. ANTHONY, AND STEPHEN E. BABCOCK, OF SAME PLACE, ONE-SIXTH TO EACH.

STEAM-TRAP.

SPECIFICATION forming part of Letters Patent No. 230,233, dated July 20, 1880.

Application filed May 11, 1880. (No model.)

To all whom it may concern:

Be it known that I, JOHN BURNS, of Troy, in the county of Rensselaer and State of New York, have invented certain new and useful Improvements in Steam-Traps, of which the following is a specification.

My invention relates to the class of steam-traps that are used for the purpose of automatically returning to the boiler the water produced by the condensation of steam in pipes, radiators, &c.; and it consists of the continuously-acting steam-trap herein described, in which is embraced chambers for receiving the water of condensation, attached to opposite ends of a vibrating frame or beam adapted to operate by the difference in the weight of the water in the oppositely-located chambers, in conjunction with shifting weights, as herein set forth, communication being formed with said chambers by means of independent steam and water pipes containing valves for controlling the admission of the steam and water into said chambers, said valves being automatically operated by the oscillations of the vibrating beam without the aid of any other valve-moving mechanism, the said steam and water pipes and the outlet-pipe being provided with a system of check-valves for preventing the steam and water from passing through such part of said pipes as would prevent the trap from properly performing its functions.

In the accompanying drawings, which form a part of this specification, and to which reference is herein made, Figure 1 is a side elevation of my improved trap with one of the side frames broken away to expose the underlying parts; Fig. 2, a plan view of the vibrating frame, steam and water pipes and valves, and the water-chambers; Fig. 3, an enlarged and detached longitudinal section of the water-supply pipe and valves; Fig. 4, an enlarged and detached longitudinal section of the steam-supply pipe and valves, and Fig. 5 a plan view of the vibrating outlet pipe and valves.

As is illustrated in the drawings, A is an open frame or beam, arranged to vibrate on the knife-edge centers *a* in openings in the upper part of the gallows-frames B. Near one side of said vibrating beam the pipes and valves for the admission of water into the trap are arranged. These consist of the following parts: A stationary water-supply pipe, C, which is connected to the waste-pipes of the radiators, &c., and passes into the valve-chest D through a stuffing-box, *d*, and terminates within said chest in the head *c*, whose center corresponds to the pivotal center of the vibrating beam A. Said head is held stationary, and is provided with an opening, *c'*, through which the water flows into the valve-chest. The head *c* is smaller than the bore of the chest D, to form a passage for the water between them. A recess is made in the head *c* for holding the valve c^2, which is free to move outward to seat itself properly over the ports, but is held by the recess from being moved by the oscillations of the chest. The said valve must be long enough to cover both of the ports *d'* when the beam A is level or at the middle of its movement. Each of the ports *d'* communicates, as shown in Fig. 3, with one of the check-valves E, so that when either of said ports is opened the pressure of the water that passes through the open port will raise the valve of the corresponding check-valve from its seat.

Near the opposite side of the beam A an arrangement of pipes and valves similar to the one just described, but designed for the admission of steam into the trap, is placed. It consists of a stationary steam-supply pipe, F, which enters the valve-chest G through the stuffing-box *g*, and is provided with the head *f*, having the opening *f'* and carrying the valve f^2 in a recess, as hereinbefore described in regard to the valve c^2. The valve-chest G is provided with ports *g'*, which communicate beneath the valves of the check-valves H. The arrangement and construction of the said steam pipes and valves are like those for the water, excepting the arrangement of the valve and ports in the valve-chests, and in this respect the two devices are arranged to work in directly opposite ways—that is to say, the arrangement is such that an open port in the valve-chest D always communicates with the elevated end of the water-pipe, and at the same time an open port in the valve-chest G

will always communicate with the depressed end of the steam-pipe, and this relative arrangement, which will be fully understood by comparing Figs. 3 and 4, which exhibit the position of the valves and ports of the water and steam pipes at the same inclination of the beam A, is essential to the proper working of my trap.

The water-pipe C′ and steam-pipe F′ extend through the vibrating beam A at each end, and are connected by the elbows I, to form a swing-joint with the T-pipe J, secured in the globular water-chambers K.

An outlet-pipe, L, is inserted in the bottom of each of the water-chambers K, and is connected, to form a swing-joint, with an elbow, M, at each end of the vibrating outlet-pipe N, that is arranged below the chambers K and adapted to move coincidentally with the vibrations of the beam A. The pipe N is fitted with two check-valves, *n*, opening toward the hollow standard O, and with the cross-pipe *n′*, which is provided with openings in its periphery, which communicate with the opening of the hollow standard O; and the said cross-pipe is adapted to receive a rocking motion in the head of said standard to suit the vibratory movements of the pipe N. An outlet-pipe, P, is attached to the hollow standard O, and is connected to the pipe through which the water is conveyed from the trap to the boiler.

Above the vibrating beam A, and attached thereto, there is a trough, Q, in which are placed the balls R, which serve as shifting counter-weights for maintaining the chambers K in their elevated positions until each chamber has, in its turn, received the amount of water required to overcome the gravity of its counter-weight. An elastic cushion, *q*, fixed at each end of the trough Q, noiselessly receives the impact of the balls R when they roll to either end of the trough, and a transverse partition, *q′*, in the middle of the trough, prevents each ball from passing that point.

An automatic air-valve, S, of the common and well-known construction, should be inserted in each of the water-chambers K, to prevent an accumulation of air in said chambers from interfering with the proper working of the trap.

In order to correctly determine the quantity of water that passes through the trap, a registering device, T, (similar in construction to those used on gas and other meters, but adapted to record either weights or quantities of water,) may be attached to the trap and be operated by the vibrations of the beam A through the connecting-rod *t*.

The operation of my trap is as follows: The water-supply pipe C is connected to the waste-pipe of the radiators, &c. The steam-supply pipe F is connected to a steam-pipe from the boiler, and the outlet-pipe P is connected to a feed-pipe leading to the boiler and provided with the usual check-valve. The water, as fast as it is condensed in the radiators and pipes, is impelled, by the pressure of the steam behind it, to enter the trap and pass into the chamber K, that is at the time in an elevated position. To reach the said chamber the water passes through the port *d′*, that is at that time moved out from under the valve c^2 by the vibration of the beam A. When a sufficient quantity of water has entered the elevated chamber K to overcome the resistance of the weight R, that is at the opposite end of the trap, the full chamber sinks down, the beam A and pipe N rock on their pivotal centers, and the empty chamber is thrown up into its elevated position. By the vibration of the beam A the port *d′*, that communicates with the now elevated (empty) chamber, is opened to allow the water to flow into said chamber, and at the same time the port *g′*, that communicates with the now depressed (full) chamber, is opened to permit the pressure of steam from the boiler to force the water out of said chamber into the boiler.

Simultaneously with the vibratory movement of the beam A the balls R change their positions in relation to the ends and center of the trough Q. As soon as the depressed chamber is emptied and the elevated one is filled the beam A again rocks on its centers *a*, and the operation above described is repeated, and the trap continues to act automatically as long as the supply of water and steam is maintained.

It will be seen that by means of the two chambers K, placed at opposite ends of a vibrating beam and arranged so that one fills while the other is emptying, my trap works with a continuous action instead of an intermittent one, like those that are commonly used for the same purpose—that is to say, in my trap while one of the chambers is being filled the other is being emptied, and by alternating in this manner a continuous action is maintained.

By proportioning the weight of the balls R to the capacity of the chambers, so as to obtain the delivery of an exact and known quantity of water into the chambers at each vibration of the beam A, a perfect record of the quantity of water fed into a boiler may be obtained by the registering device T, and for this reason my trap will be an effective and valuable appliance for determining the quantity of water evaporated by a known quantity of fuel.

By the arrangement of check-valves E, H, and *n* herein shown and described, the steam is prevented from forcing the water out of the depressed chamber in any other direction except the one leading through the outlet-pipe P to the boiler.

When preferred, the partition *q′* may be left out of the trough Q, and a single shifting weight, R, may then be used instead of the two herein shown and described; but in this modification the weight will shift from one end of the trough to the opposite end.

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

1. The vibrating frame or beam A, provided

with independent water and steam pipes, having valve-chest provided with ports that are opened and closed by the vibratory movements of said chests on stationary valves, as herein described, in combination with the water-chambers K, vibrating pipe N, and one or more shifting weights, R, all constructed and arranged to operate substantially as herein specified.

2. The arrangement of the independent valves c^2 and f^2 for the water and steam pipes in relation to each other and to their respective valve-chests D and G, provided with the ports d' and g', as herein described—that is to say, that arrangement of said parts that is adapted to permit the water to flow into one of the water-chambers K while the steam flows into and forces the water out from the oppositely-located water-chamber, as herein specified.

3. In a steam-trap, the water-chambers K, attached to the pipes C′ and F′ (of the vibrating frame or beam A) and to the vibrating pipe N by means of swinging joints, as herein described, in combination with the valve-chests D and G, provided with the ports d' and g' and adapted to vibrate on the stationary valves c^2 and f^2, as herein described, and one or more shifting weights, R, as and for the purpose herein specified.

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D. H. HUMPHREY.