No. 790,877. PATENTED MAY 30, 1905.

F. T. BAILEY, W. P. BROWN & M. BAILEY.

STEAM TRAP.

APPLICATION FILED NOV. 20, 1902.

2 SHEETS—SHEET 1.

Fig. 1.

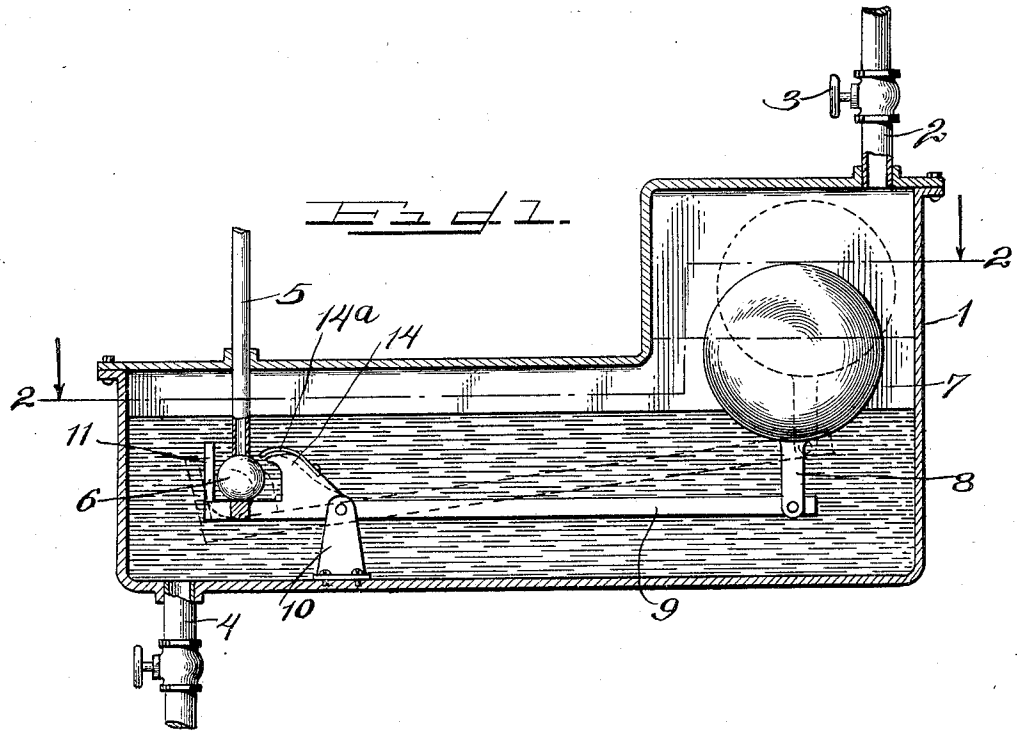
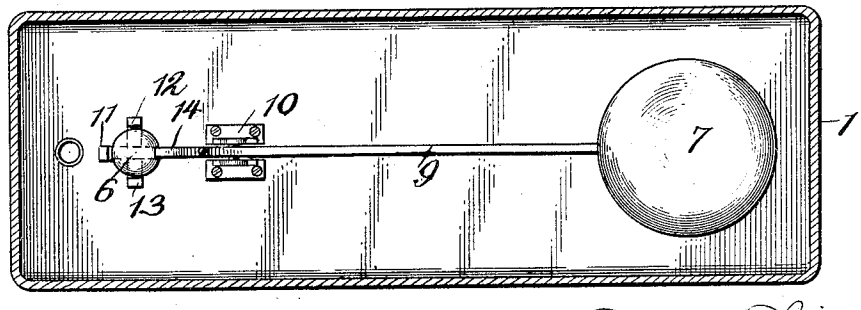


Fig. 2.



Franklin T. Bailey
William P. Brown
Mark Bailey
INVENTORS

WITNESSES:
John O. Templer
Edwin Seger

BY Kenyon & Kenyon
ATTORNEYS.

No. 790,877. PATENTED MAY 30, 1905.

F. T. BAILEY, W. P. BROWN & M. BAILEY.

STEAM TRAP.

APPLICATION FILED NOV. 20, 1902. 2 SHEETS—SHEET 2.

Fig. 3.

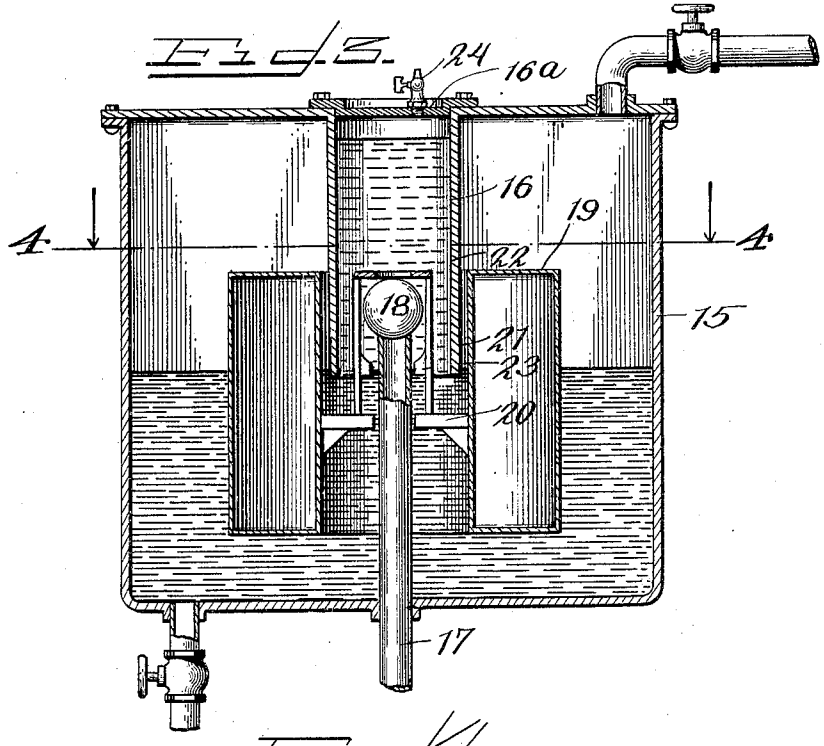
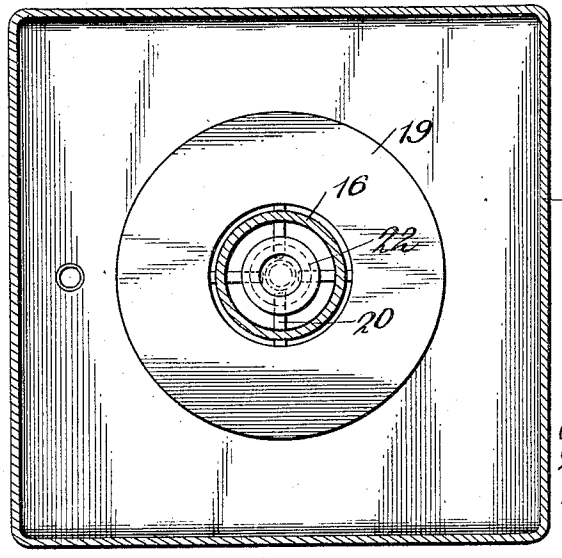


Fig. 4.



WITNESSES:

John O. Gempler

Edwin Segar

Franklin T. Bailey,
William P. Brown,
Mark Bailey,
INVENTORS

BY Kenyon & Kenyon

ATTORNEYS

No. 790,877. Patented May 30, 1905.

UNITED STATES PATENT OFFICE.

FRANKLIN T. BAILEY AND WILLIAM P. BROWN, OF BROOKLYN, AND MARK BAILEY, OF NEW YORK, N. Y.

STEAM-TRAP.

SPECIFICATION forming part of Letters Patent No. 790,877, dated May 30, 1905.

Application filed November 20, 1902. Serial No. 132,064.

To all whom it may concern:

Be it known that we, FRANKLIN T. BAILEY and WILLIAM P. BROWN, residents of Brooklyn, county of Kings, and MARK BAILEY, a resident of the city and county of New York, State of New York, citizens of the United States, have invented certain new and useful Improvements in Steam-Traps, of which the following is a specification.

This invention relates to devices for automatically discharging fluid from receptacles wherein the discharge is controlled by the variation of level of a liquid in the receptacle.

While the invention as to some of its features is useful for various purposes, as for controlling the discharge of air from tanks, pipes, &c., the invention is particularly useful as applied to steam-traps, boiler-feeders, and similar devices for controlling the discharge of liquids from receptacles.

As heretofore constructed the devices of the character referred to are either designed or in practice operate to permit the water or other fluid to slowly escape either continuously or intermittently through a small aperture formed between an outlet-valve and its seat. This small aperture is apt to become clogged, especially where low pressures are used, and where high pressures are employed the great velocity of the water at the point of discharge causes rapid wear of the valve-surfaces, the result being in either case the rapid development of wasteful leaks and unreliability of operation, aside from the restriction of capacity, due to the small discharge-aperture.

The objects of the present invention are to overcome these defects, and more particularly to provide in a device of the character referred to a construction whereby a discharge or outlet passage for the water having ample dimensions is instantly and fully opened when the water reaches a certain level and is suddenly and accurately closed when a certain quantity of water has been discharged, also to provide a construction which, nevertheless, is simple and reliable in operation and not apt to get out of order.

With these and other objects in view the invention consists in the combination of a casing having inlet and outlet passages, a valve for controlling the outlet-passage, said valve being adapted to be seated by the pressure in the casing, a float, and connections between the float and the valve, said connections being constructed to permit limited motion of the float independently of the valve.

In accordance with the best embodiment of the invention a spherical outlet-valve is used, the same being controlled by means permitting it to be freely seated by the pressure within the casing. In this connection the invention also consists in the combination of a casing having inlet and outlet passages, a ball-valve adapted to be held to its seat by the pressure in the receptacle, a float, and connections between the valve and the float, including a cage in which the valve has a limited movement in a direction to and from its seat.

In the best embodiment of the invention the seat for the ball-valve is formed directly on the mouth of the outlet-passage and the ball is loosely held in the cage in such a manner as to present a true and unrestrained spherical surface to the seat whenever the valve is closed.

In the best embodiment of the invention also the means for opening the valve are such as to apply a pressure to the ball tending to move it off its seat, said pressure gradually increasing until it is sufficient to overcome the force with which the ball is held to its seat and then to instantly force the ball entirely away from its seat, so as to permit an unrestricted discharge of the water through the outlet-passage.

The invention also consists in certain other features of construction and combinations of parts herein shown and described.

The accompanying drawings, which are referred to herein and form a part hereof, illustrate two embodiments of our invention as applied to steam-traps and similar liquid-discharging devices and serve, in connection with the description herein, to explain the principles thereof.

Of the drawings, Figure 1 is a vertical longitudinal section of a steam-trap constructed in accordance with our invention. Fig. 2 is a sectional plan view of the same, the section being taken on the line 2 2 of Fig. 1. Fig. 3 is a vertical transverse section of another form of steam-trap constructed in accordance with our invention; and Fig. 4 is a sectional plan view of the same, taken on the line 4 4 of Fig. 3.

In accordance with the construction shown in Figs. 1 and 2 the trap comprises a closed casing 1, constructed of cast-iron or other material adapted to withstand the pressure under which the steam-heating apparatus to which the trap is connected is operated. 2 is an inlet-passage by which the trap is so connected with the steam-heating apparatus that the water of condensation formed therein will be drained into the trap in the usual manner, the inlet-pipe 2 being provided with a hand-valve 3. For the purpose of draining the water off from the trap and washing the same out from time to time a valved blow-off or waste pipe 4 is arranged to communicate with the bottom of the casing. In accordance with the form of device shown in Figs. 1 and 2 the discharge-passage for the water of condensation is formed by a pipe 5, which projects downwardly through the top of the casing, near one end thereof, and terminates at a point some distance above the bottom of the casing. In accordance with the best embodiment of the invention the valve controlling the discharge-passage is arranged to be seated by the pressure within the casing on a seat formed directly on the lower end of the discharge-pipe 5. Preferably and as shown this valve consists of a ball 6, having a smooth spherical surface any part of which is adapted when seated upon the end of the discharge-pipe 5 to accurately fit the seat formed thereon and securely close the passage therethrough. The ball-valve 6 may be manipulated to open or close the discharge-passage at the required intervals by any suitable means adapted to entirely remove the ball from its seat when the water of condensation in the casing reaches a certain level and to replace the ball on its seat when a certain amount of water has been discharged from the trap. In accordance with the construction shown a float 7 is provided for this purpose, the connections between the float and the ball being such as to permit a limited movement of the float independently of the ball. As shown, the float 7 is pivotally connected, by means of an arm 8, with one end of a lever 9, which is pivoted at a point between the ball and the float to a bracket 10, secured in the casing 1. For the purpose of permitting the ball 6 to rest freely on its seat on the end of the pipe 5 and at the same to provide for lost motion between the ball and the float the lever 9 is provided with a cage-like construction in which the ball 6 is loosely confined. This cage, as shown, consists of a series of four fingers 11, 12, 13, and 14, which are formed at or near the end of the lever 9 and project upwardly around the ball 6. The finger 14 at its upper end projects toward and somewhat over the ball 6, and is provided with a surface adapted when the water has reached a certain level in the casing 1 to contact with the upper surface of the ball near the pipe 5. The end of the finger 14, however, is terminated at such a point above the surface of the lever 9 as to provide for a suitable amount of lost motion between the lever and the ball. It follows from this construction that when the float has been lifted by the water of condensation as it collects in the casing 1 until the end of the arm 14 strikes the ball 6 the movement of the float will be arrested until the buoyant force of the float has been so increased by the continued rise of the water as to overcome the force with which the ball 6 is held to its seat by the pressure within the casing. As soon as this force is overcome the float will shoot upwardly, and thus force the ball entirely away from the mouth of the outlet-passage. To make the removal of the ball more certain, the finger 14 may be provided with or replaced by a spring-finger 14ª, which by its resiliency will assist in throwing the ball entirely away from its seat. In order that the ball when thus removed from its seat may drop to the lower part of the cage, so as not to be brought back to its seat until a considerable quantity of the water of condensation has been discharged from the casing, the ball is preferably made of metal or some material having greater specific gravity than water, and in order that the ball may not be held near its seat by the outflowing current of water it is preferably made considerably larger than the diameter of the outlet-passage, the size and weight of the ball being regulated according to the pressure at which the apparatus is to be operated. The greater the pressure in the casing the higher will be the velocity of the outflowing current of water and the greater will be the required weight of the ball 6. The ball should not be so heavy, however, that when it has been seated by the action of the float-lever it will not be securely held there, so as to prevent leakage by the pressure within the casing. Preferably the weight of the ball is so regulated that when it has been brought very close to its seat by the action of the lever the outrushing current of water will complete the seating operation, and thus carry the ball to its seat independently of the pressure of the float-lever, as by this construction the ball will be more suddenly and more accurately seated than it would be by the action of the float-lever alone.

In accordance with the form of the device illustrated in Figs. 3 and 4 the valve for controlling the discharge-passage is arranged to

open upwardly instead of downwardly and the float is more directly connected with the valve than in the previous form of the device, the float-lever being omitted. In accordance with the construction shown the casing of the trap is substantially square in cross-section and the top thereof is provided with a depending rib forming a cylindrical chamber 16 open at its bottom and closed at its top by a removable cover 16ª, by which access may be had to the operative parts of the device. The discharge-pipe 17 projects upwardly through the bottom of the casing and a suitable distance into the lower end of the chamber 16. As in the previous form of the device, the valve controlling the outlet-passage is seated directly on the end of the pipe, and preferably also this valve consists of a ball 18. In the best embodiment of this form of the device the ball 18, however, is made light enough to float in the water, so that when the force with which it is held to its seat by the pressure in the receptacle is overcome the ball will by its buoyancy move rapidly away from the mouth of the outlet-passage, so as to leave said passage unobstructed. The float by which the ball is controlled consists of an annular hollow casing 19, which surrounds the outlet-pipe 17, and the cylindrical casing 16, the same being guided in its vertical movements by a series of four inwardly-projecting arms 20, the ends of which lie close to the sides of the discharge-pipe 17. As in the previous form of the device, the connections between the float and the valve preferably include a cage in which the valve is loosely confined and by means of which the float is free to move a limited distance independently of the valve. As shown, the cage consists of a series of uprights 21, which are rigidly connected at their lower ends to the arms 20 and carry at their upper ends a ring or plate 22, adapted to confine the ball 18 within the space between the uprights 21. The uprights 21 are provided at points a sufficient distance below the ring 22 to provide a desired amount of lost motion between the float 19 and the valve with a series of lugs 23, adapted to engage the lower surface of the ball 18 near the point where it is seated on the end of the discharge-pipe 17. It follows from this construction that when the float is moved upwardly by the water of condensation collected in the casing 15 until the lugs 23 engage the under surface of the ball the float will be arrested in its movement until the buoyant force thereof is so increased as to overcome the force with which the valve 18 is held to its seat by the pressure in the casing. The float, together with the valve, will then shoot rapidly up, so as to entirely remove the valve from the mouth of the outlet-passage. The valve 18, moreover, when made buoyant will float to the upper end of its cage and will remain there until sufficient of the water in the casing has been discharged to cause the float to force the ball down to its seat. In this connection it should be observed that the casing 16 should be made so long that its lower end is always below the level of the water in the casing 15, the interior of the casing being kept full of water, so as to float the valve 18 by the pressure in the main casing. A petcock 24 is preferably provided to draw off any air which may collect in the chamber 16.

The main advantages of a device constructed in accordance with our invention are that a discharge-passage of ample dimensions is provided for the fluid and that this discharge-passage is always either entirely open or entirely closed, so that there is no liability of its becoming clogged and there is little or no tendency for the formation of wasteful leaks. The apparatus at the same time is simple and cheap in construction and the moving parts are free from friction and other forces tending to interfere with their prompt and reliable operation.

The invention in its broader aspects is not limited to the particular constructions shown nor to the particular construction by which it may be carried into effect, as may changes may be made in the details of the construction without departing from the main principles of the invention and without sacrificing its chief advantages.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination of a casing having inlet and outlet passages, a valve for controlling the outlet-passage, a float, and connecting means between the valve and the float whereby the float is permitted to move independently of the valve and is caused to suddenly fully open and close the outlet-passage at or near the limit of the independent movement of the float.

2. The combination of a casing having inlet and outlet passages, a valve for controlling the outlet-passage, said valve being adapted to be seated by the pressure in the casing, a float, and connecting means between the valve and the float whereby the float is permitted to move independently of the valve and is caused to suddenly fully open and close the outlet-passage at or near the limit of the independent movement of the float.

3. The combination of a casing having inlet and outlet passages, a free ball-valve for controlling the outlet-passage, said valve being adapted to be seated by the pressure in the casing, a float, and connecting means between the valve and the float whereby the float is permitted to move independently of the valve and is caused to suddenly fully open and close the outlet-passage at or near the limits of the independent movement of the float.

4. A steam-trap comprising a casing having inlet and outlet passages, a ball-valve adapted

to be seated on the mouth of the outlet-passage, a float, and connections between the valve and the float, said connections including a cage in which the valve has a limited motion in a direction to and from its seat, whereby the valve is operated by the float to open and close the outlet-passage at or near the limits of a predetermined movement of the float.

5. A steam-trap comprising a casing having inlet and outlet passages, a ball-valve adapted to be seated on the mouth of the outlet-passage, a float, and a lever to which said float is connected, said lever having a cage in which said ball has a limited movement to and from its seat, whereby the valve is operated by the float to fully open and close the outlet-passage at or near the limits of a predetermined movement of the float.

6. A steam-trap comprising a casing having an inlet-passage and an upwardly-opening outlet-passage, a ball-valve having a specific gravity greater than water adapted to be seated on the mouth of the outlet-passage by the pressure in the casing, a lever pivoted at an intermediate point in said casing, said lever having at one end a cage in which said ball has a limited movement to and from its seat, and a float connected to the other end of said lever.

7. A steam-trap comprising a casing having inlet and outlet passages, a valve for controlling the outlet-passage, said valve being adapted to be seated by the pressure in the casing, a float, and connections between the valve and the float, said connections including a spring device whereby the valve is suddenly forced away from the seat when the water reaches a predetermined level in the casing.

8. A steam-trap comprising a casing having inlet and outlet passages, a ball-valve adapted to be seated on the mouth of the outlet-passage, a float, and connections between the float and the valve, said connections including a spring device arranged to be flexed when the valve is about to be opened, whereby the valve is suddenly moved entirely away from its seat when the water reaches a predetermined level in the casing.

9. A steam-trap comprising a casing having inlet and outlet passages, a ball-valve adapted to be seated on the mouth of the oulet-passage, a float, a lever to which said float is connected, said lever having a cage in which said ball has a limited movement to and from its seat, and a spring device adapted to force the ball entirely away from its seat when the water has reached a predetermined level in the casing.

10. A steam-trap comprising a casing having inlet and outlet passages, a valve for controlling the outlet-passage, a float, connections permitting independent movement between the valve and the float, and means whereby the float is caused to operate the valve to suddenly fully open the outlet-passage at or near the upper limit of the independent movement of the float.

11. A steam-trap comprising a casing having inlet and outlet passages, a free ball-valve for controlling the outlet-passage, a float, connections permitting independent movement between the valve and float, and means whereby the float operates the valve to suddenly fully open the outlet-passage at or near the upper limit of the independent movement of the float.

12. A steam-trap comprising a casing having inlet and outlet passages, a valve for controlling the outlet-passage, a float, and connecting means between the valve and the float whereby the float is permitted to move independently of the valve and is caused to suddenly fully open the outlet-passage at or near the upper limit of the independent movement of the float.

13. A steam-trap comprising a casing having inlet and outlet passages, a ball-valve adapted to be seated on the mouth of the outlet-passage, a float, and connecting means between the valve and the float whereby the float is permitted to move independently of the valve and is caused to suddenly fully open the outlet-passage at or near the upper limit of the movement of the float.

14. A steam-trap comprising a casing having an inlet-passage and an upwardly-opening outlet-passage, a ball-valve having a specific gravity greater than water adapted to be seated in an upward direction on the mouth of the outlet-passage by the pressure in the casing, and means for opening and closing said valve.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

FRANKLIN T. BAILEY.
WILLIAM P. BROWN.
MARK BAILEY.

Witnesses:
JOHN O. TEMPLER,
EDWIN SEGER.