No. 790,878. PATENTED MAY 30, 1905.

M. BAILEY.

DISCHARGE DEVICE.

APPLICATION FILED JULY 14, 1904.

Fig. 1,

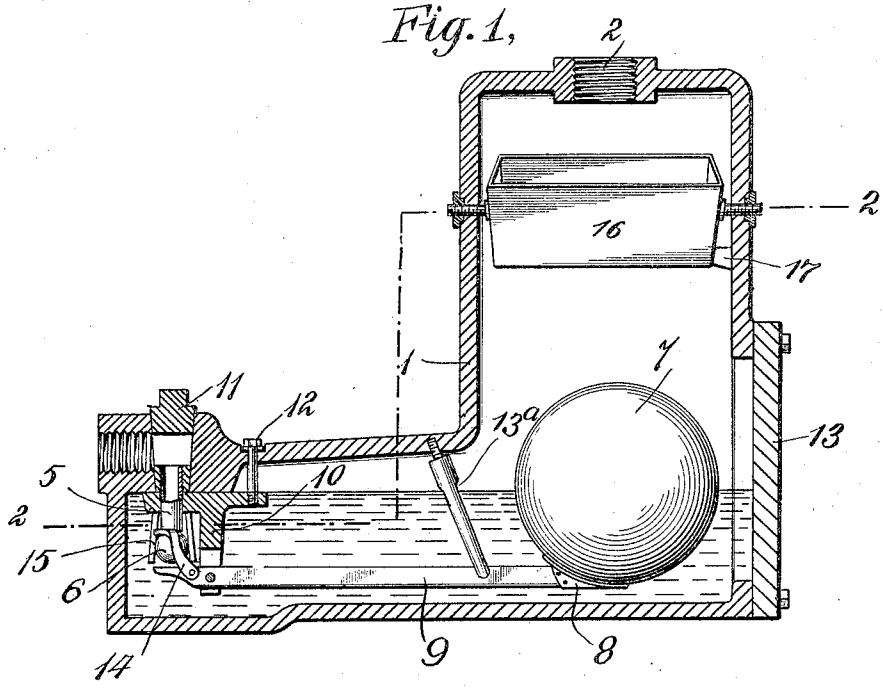
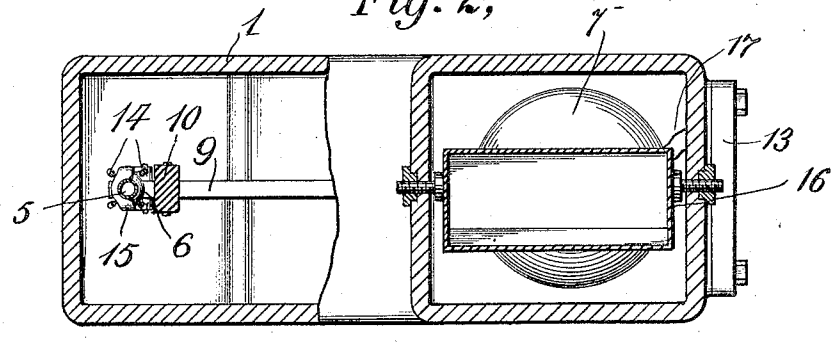


Fig. 2,



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No. 790,878. Patented May 30, 1905.

UNITED STATES PATENT OFFICE.

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DISCHARGE DEVICE.

SPECIFICATION forming part of Letters Patent No. 790,878, dated May 30, 1905.

Application filed July 14, 1904. Serial No. 216,625.

To all whom it may concern:

Be it known that I, MARK BAILEY, a citizen of the United States, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Discharge Devices, of which the following is a specification.

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

The invention is particularly useful as applied to steam-traps, boiler-feeders, and similar devices for controlling the discharge of liquid under pressure 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 escape slowly, 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 such pressures are employed the great velocity of the water or other fluid at the point of discharge causes rapid wear of the valve-surface, the result being in either case 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 the discharge or outlet passage having ample dimensions is instantly and fully opened when the liquid reaches a certain level and is suddenly and accurately closed when a certain quantity of liquid 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, connections between the float and the valve, and means for suddenly raising the level of the liquid in the casing, whereby the valve is suddenly forced away from its seat.

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 seated freely by the pressure within the casing, and the connections between the float and the valve are constructed to permit limited movement of the valve independently of the float.

In the best construction the outlet-passage faces downwardly within the casing, so that the valve closes by an upward movement, and the valve is made heavier than water or with a specific gravity greater than unity, so that when the valve is forced away from its seat, so as to relieve it from the pressure in the casing, it falls entirely free of the outlet-opening and permits the flow of liquid therethrough.

In the best construction also the means for suddenly raising the level of the liquid in the casing consists of a tipping bucket, which receives the water entering the casing and when full or nearly full suddenly discharges the water into the main body of water in the casing, thereby raising its level suddenly. By reason of this construction when the water rises in the casing to a point which renders the float operative to open a valve the next discharge of the tipping bucket will operate to lift the float suddenly, so as to force the valve entirely away from its seat and permit a full discharge through the outlet. By reason of this construction also the water in the casing is intermittently agitated, so that any sediment which may be in the casing will be prevented from settling and will be discharged with the water, so that frequent cleaning of the casing will be unnecessary.

The invention also consists in the other novel 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 one embodiment of the invention as applied to steam-traps 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 the invention; and Fig. 2 is a central sectional plan view of the same, the section being taken on the line 2 2 of Fig. 1.

Referring to the particular construction illustrated by way of example in the drawings, 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. The inlet 2 is so connected with the steam heating apparatus that the water of condensation formed therein will be drawn into the trap in the usual manner, said inlet being provided with a hand-valve, (not shown,) as usual. The discharge-passage for the water of condensation is formed by a short 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 construction the valve controlling the discharge-passage is arranged to be seated by the pressure within the casing 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 fit accurately the seat formed thereon and securely close the passage therethrough. The discharge-pipe 5 and the ball are preferably formed of a hard tough material which will not wear easily and will not corrode. The material preferably employed is hard phosphor-bronze. The ball-valve 6 may be manipulated to open or close the discharge-passage at the required intervals by any suitable means adapted to remove suddenly the ball entirely from its seat when the water of condensation in the casing reaches a certain level and to replace the ball suddenly to its seat when a certain quantity 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 is connected by means of a bracket 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. To permit easily the removal of the discharge-pipe 5, together with the valve 6 and float 7, the bracket is secured to the pipe 5, and the pipe and bracket are secured in place by a tapered plug 11, which is threaded at the upper end of the pipe 5 and is seated in a conical opening in the casing 1, so as to draw the bracket 10 home to its seat on the inner surface of said casing. A stay-bolt 12 fixes the angular position of the bracket 10 and assists in firmly holding it in position. By removing the plug 11 and bolt 12 the valve and float and all parts associated therewith can be removed through a suitable opening in the casing, said opening being closed in the construction shown by the removable cover 13. A guide-fork 13^a may be provided to steady the lever 9.

For the purpose of permitting the ball 6 to rest freely on its seat on the end of pipe 5 and at the same time to provide for lost motion between the valve and the float the lever 9 is provided with a cage-like structure, in which the ball 6 is loosely confined. This cage, as shown, consists of a yoke 14, pivoted to the lever 9 near its fulcrum-point and arranged to engage the ball 6 at its top adjacent to the pipe 5. To confine the ball between the top of the yoke 14 and the end of the lever 9, between which parts the ball has considerable lost motion, a series of four guide-fingers 15 is provided, said fingers being rigidly connected to the bracket 10. 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 top of the yoke 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 suddenly force the ball entirely from the mouth of the inlet-passage. When the ball has been released from the pressure, it falls, by reason of its greater specific gravity, away from the opening and freely rests on the short end of the lever 9.

To insure the sudden rise of the float when the rise of the water in the casing has brought the yoke 14 into contact with the ball, any suitable means may be provided. In accordance with the construction shown a tipping bucket 16 is provided for this purpose, the same being arranged to receive the water from the inlet-passage 2 and intermittently dump the same into the float-chamber. This bucket is so constructed that when it is empty it stands in a substantially level position, the rear edge resting on a suitable lug 17, projecting from the inner wall of the casing 1. As the water collects in the bucket, however, it overbalances the force by which the bucket is held upright and automatically tips the bucket so as to discharge the water. The capacity of the bucket is such that when the yoke 14 has been brought into contact with the ball 5 one bucketful of water will raise the level of the water in the casing to such an extent as to force the ball 6 so far away from its seat that the pressure at opposite sides of the ball is balanced, and the same will fall by its greater specific gravity to the bottom of the cage on the lever 9. The intermittent discharge of the water from the bucket into the

casing also has the effect of keeping any sediment in the float-chamber in suspension, so that the sediment will be discharged with the water from the apparatus. Cleaning the apparatus by hand is thereby rendered unnecessary.

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 outside passage, the size and weight of the ball being designed according to the pressure under 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 size and 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 by the pressure in the casing, so as to prevent leakage. In the best construction also the size and weight of the ball is so proportioned with reference to the pressure that when the ball has been brought close to its seat by the closing movement of the lever the outrushing current of water will compel the sudden operation independently of the lever and float, and thus carry the ball to its seat suddenly. By this construction the ball will be more accurately seated than it could be by the action of the float-lever alone.

The main advantages of a device constructed in accordance with this invention are that a discharge-passage of ample dimensions is provided for the liquid 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, is self-closing, 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 construction shown nor to the particular constructions by which it may be carried into effect, as many 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 my invention, what I claim, 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, said valve being adapted to be seated by the pressure in the casing, a float, connections between the valve and the float, and means for intermittently raising the level of the liquid in the casing, whereby the valve is suddenly operated to fully open the outlet-passage when the liquid reaches a predetermined level in the casing.

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 pressure in the casing, a float, connections between the valve and the float, said connections being constructed to permit a limited movement of the float independently of the valve, and means for intermittently and suddenly raising the level of the liquid in the casing, substantially as described.

3. 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, connections between the valve and the float, and a tipping bucket, whereby the valve is suddenly forced away from its seat when the liquid reaches a predetermined level in the casing.

4. The combination of a casing having an inlet and a downwardly-opening outlet passage, a free ball-valve having a specific gravity greater than the liquid in the casing for controlling the outlet-passage, a float, connections between the float and the valve, said connections being constructed to permit a limited movement of the float independently of the valve, and means for intermittently and suddenly raising the level of the liquid in the casing, whereby the valve is suddenly forced away from its seat when the liquid reaches a predetermined level in the casing.

5. The combination of a casing having inlet and outlet passages, a free ball-valve adapted to be seated on the mouth of the outlet-passage, a float, a lever to which said float is connected, said lever having a cage in which said ball-valve has a limited movement to and from its seat, and a tipping bucket for suddenly raising the level of the liquid in the casing, whereby the ball is suddenly forced entirely away from its seat when the liquid reaches a predetermined level in the casing.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MARK BAILEY.

Witnesses:
J. H. FREEMAN,
EDWIN SEGER.