No. 688,304. Patented Dec. 10, 1901.

F. GRINNELL.

APPARATUS FOR OPERATING ALARMS OR OTHER DEVICES.

(Application filed Mar. 28, 1900.)

(No Model.)

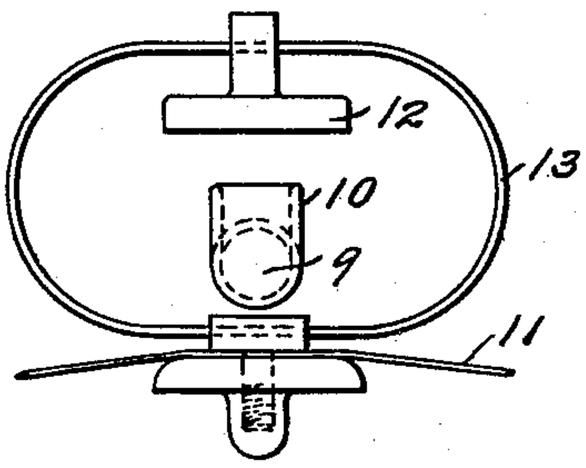

FIG. 2.

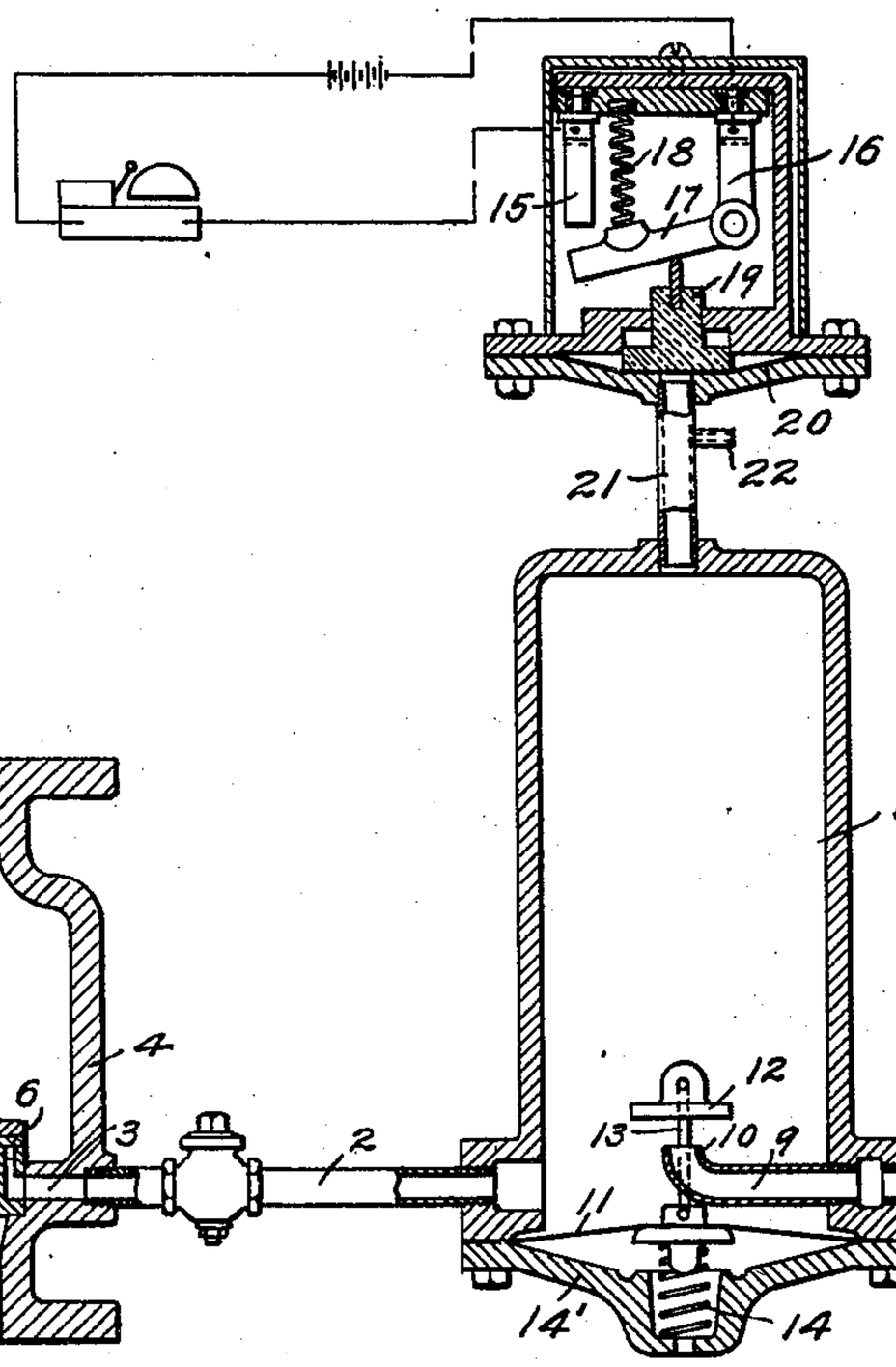

FIG. 1.

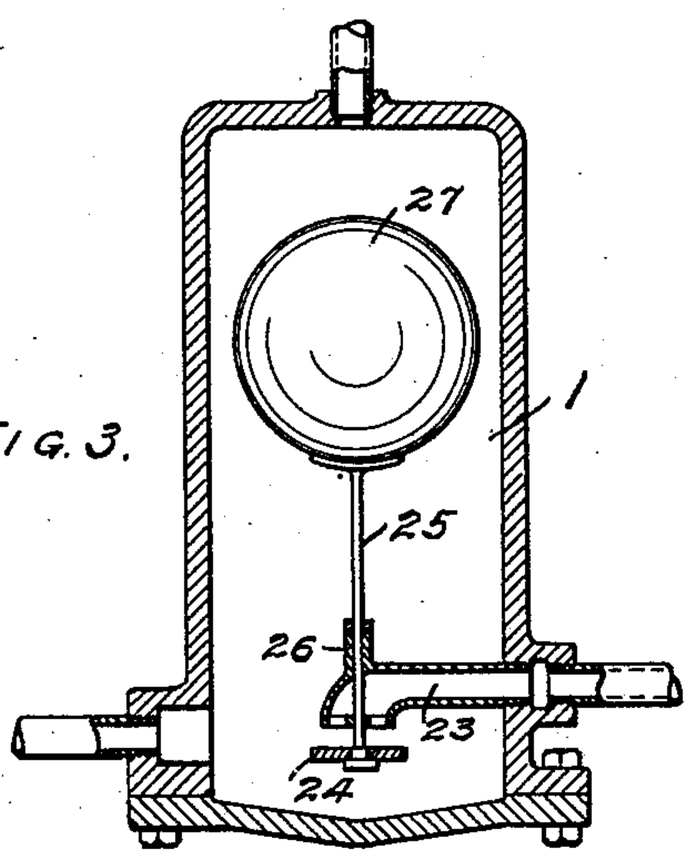

FIG. 3.

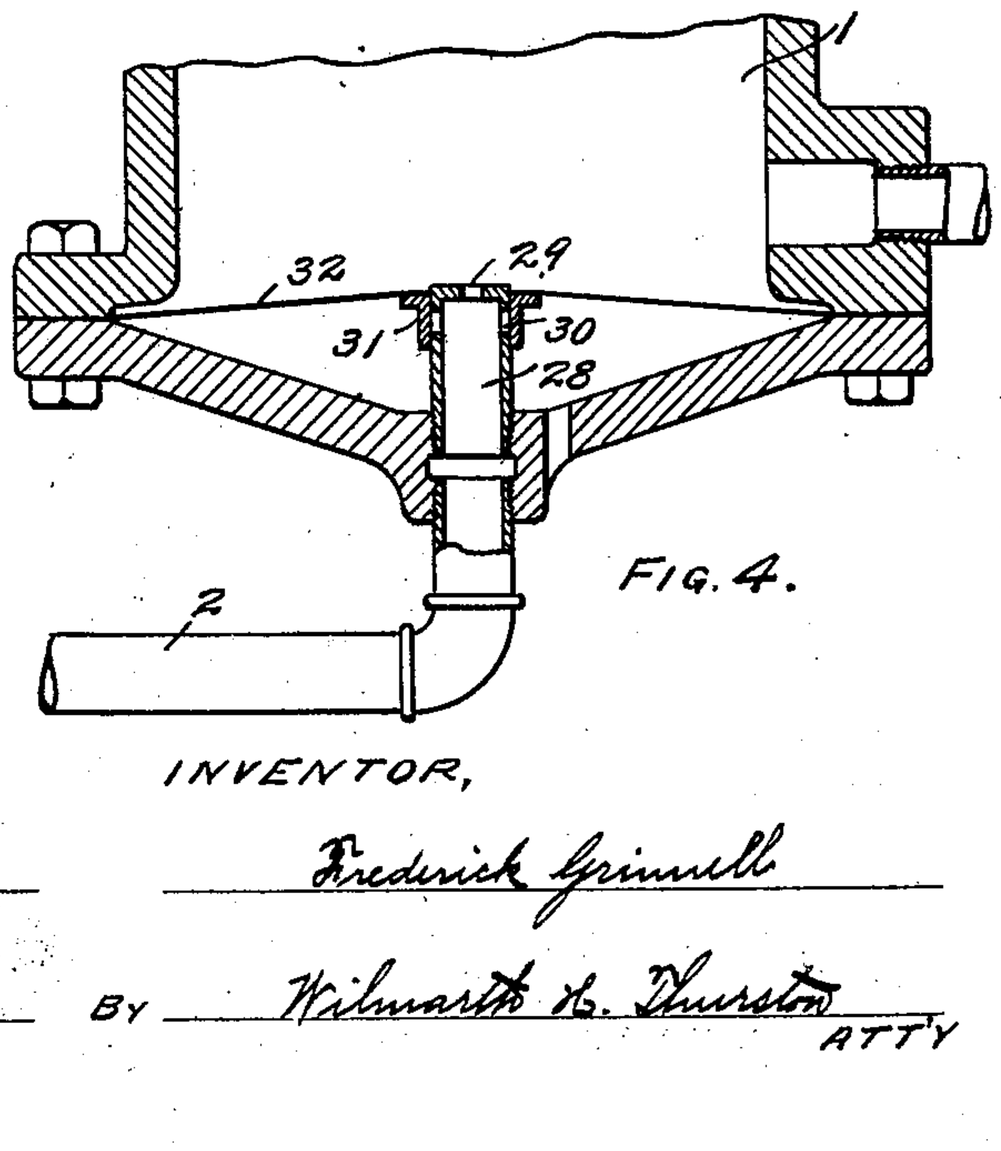

FIG. 4.

WITNESSES,

Ira L Fesler

John Hemstead

INVENTOR,

Frederick Grinnell

BY Wilmarth H. Thurston
ATT'Y

UNITED STATES PATENT OFFICE.

FREDERICK GRINNELL, OF NEW BEDFORD, MASSACHUSETTS, ASSIGNOR TO THE GENERAL FIRE EXTINGUISHER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

APPARATUS FOR OPERATING ALARMS OR OTHER DEVICES.

SPECIFICATION forming part of Letters Patent No. 688,304, dated December 10, 1901.

Application filed March 28, 1900. Serial No. 10,501. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK GRINNELL, of New Bedford, county of Bristol, and State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Operating Alarms or other Devices; and I do hereby declare the following specification, taken in connection with the accompanying drawings, forming a part of the same, to be a full, clear, and exact description thereof.

The invention relates to an apparatus for causing the operation of a device such as an alarm, for instance, whenever there is an escape of liquid from the system of pipes to which the apparatus is connected, and more especially relates to an apparatus in which the device is operated or controlled by the liquid in the system acting through a normally-closed communication which is opened upon the escape of liquid from the system. This form of apparatus is especially useful in connection with automatic fire-extinguisher systems for operating an alarm, and this application of the invention will be referred to in more fully explaining the invention.

Alarm devices of the general character above referred to have heretofore been used in connection with fire-sprinkler systems, and when so used the communication with the system has usually been controlled by a check-valve located at the entrance to the system of sprinkling-pipes. When the sprinkler system is supplied from water-pipes which also supply water for other purposes, the check-valve is liable to be opened for an instant at more or less frequent intervals by water-hammer produced in the supply-pipes. These openings may occur at such short intervals that a considerable flow of water to the alarm devices is produced, and with the previous construction of such devices this flow may be sufficient to operate them, thus giving a false alarm. This danger of giving false alarms is the chief objection to the previous constructions, which objection the present invention overcomes by providing an alarm device of the general character referred to which will surely operate upon the opening of a sprinkler, but which will not be operated by successive and frequent openings of the communication with the system. This is accomplished by increasing the ratio between the areas of the supply and discharge openings of a receiving-chamber whenever the communication between said chamber and the water-supply system remains open a predetermined time and causing an alarm to be operated upon such increase in ratio. In the preferred embodiment of the invention the discharge for the receiving-chamber is so proportioned with relation to the supply that there is a differential accumulation of water in the receiving-chamber, which when it reaches a certain amount causes the increase in the ratio between the supply and discharge. By properly proportioning the supply and discharge openings any desired rate of accumulation may be produced with a given pressure in the system, and the other parts of the apparatus may be proportioned and constructed to operate the alarm whenever the accumulation has reached a predetermined amount. With this construction the discharge-opening from the receiving-chamber may be made of a size to prevent a sufficient accumulation of water in the receiving-chamber to operate the alarm unless the communication with the system remains open for a considerable length of time, which condition will only occur when the escape of water from the system is continuous, as upon the opening of a sprinkler. Moreover, with this construction comparatively large openings for the passage of the water may be provided, thus avoiding any danger of said openings becoming clogged or stopped, so as to prevent the operation of the alarm at the proper time or to cause an operation of the alarm at an improper time. The ratio between the supply and exhaust may be increased by reducing the area of the discharge or by increasing the area of the supply or by doing both and is preferably effected by closing the discharge, as in such case the full pressure of the system is rendered effective and the waste of water is also stopped.

In the accompanying drawings, in which are shown several constructions embodying the invention, Figure 1 is a sectional elevation showing an apparatus embodying the

invention in its preferred form. Fig. 2 is an enlarged detail showing the means for securing the valve to the diaphragm. Fig. 3 is a section showing a modification, and Fig. 4 is a section showing another modification.

In the construction shown in Fig. 1 a receiving-chamber 1 is connected to a water-supply system through a pipe 2, one end of which opens into said chamber and the other end of which opens into a chamber or passage 3, formed in a casting 4, which is included in the system of water-supply pipes. The communication between the receiving-chamber and the system may be normally closed by any suitable means which will open upon the reduction of pressure in the system and is preferably so closed by a device which is operated by variation in the pressures on opposite sides of said device. In the preferred construction this device consists of a check-valve 5, which is seated upon a valve-seat 6 and is normally held thereon by the pressure above said valve, the construction being such that the area of the valve subjected to the pressure above is greater than the area subjected to the pressure under the valve. The passage 3 communicates with the system through an annular chamber 7, formed in the valve-seat 6 and arranged to be closed by the valve 5. When the valve 5 is lifted from its seat, as it will be whenever the pressure above is reduced, a certain amount below the pressure below said valve or the pressure below is correspondingly increased, the communication between the system and the receiving-chamber is opened, and the water from said system flows into the receiving-chamber until said valve 5 closes. The chamber 1 is provided near its lower end with a discharge which in the construction shown consists of a pipe 9, extending inward from the wall of the chamber and having an upturned end 10. The discharge is normally open, so that any water in the chamber above said discharge may flow freely out of said chamber. The area of the discharge is so proportioned with relation to the area of the supply-passage which communicates with the system that the flow of water through the supply-passage under the pressure in the system will be somewhat greater than the flow of water through the discharge under the atmospheric pressure in the chamber. There is therefore a differential accumulation of water in the receiving-chamber when the valve 5 is open, which gradually fills said chamber. The rate of accumulation may be varied to suit the circumstances by varying the relative areas of the supply and discharge. When the accumulation in the chamber 1 reaches a certain amount, the ratio between the area of the supply and the area of the discharge is increased, thus increasing the rate of accumulation in the chamber in case said chamber is not full of water or increasing the pressure in said chamber if said chamber is full. The length of time that the valve should remain open in order for the required accumulation to occur will depend on the rate of accumulation. In the preferred construction the accumulation of water in the chamber is employed to cause the increase in ratio referred to, and the increased supply or pressure thus effected is caused to operate an alarm. Any suitable device operated by the accumulation of water in the chamber may be employed for increasing the ratio referred to; but it is preferred to employ a movable diaphragm which is acted upon by the water in the chamber 1. In the construction being described this diaphragm 11 is located at the bottom of the chamber 1 and is subjected to the weight and pressure of the water in the chamber. The increase in ratio referred to is effected in this construction by closing the discharge. For this purpose a valve 12 is connected with the diaphragm 11 by means of a spring 13, and is arranged to close the end of pipe 9 when the diaphragm is forced down by the accumulation of water in chamber 1. The diaphragm 11 may be so constructed that it will be operated by the weight of the water above it before the chamber is entirely full, or it may be constructed so that it will not be operated until the chamber is full of water under pressure. A spring 14 may be employed if found desirable to assist the diaphragm in sustaining the pressure above it. When the diaphragm is operated, the valve 12 is forced against the end of pipe 9, the spring 13 allowing the diaphragm to move slightly thereafter and seat itself on the casting 14′, secured to the end of the chamber 1. When the discharge is closed, the water flowing into the chamber 1 or the increased pressure thus produced is utilized in causing the operation of an alarm. This alarm may be operated by the flow of water, as by a water-motor, or it may be an electric alarm the operation of which is controlled by the pressure in the chamber 1, or other forms of alarms may be used. For the purpose of illustration one form of an electric alarm apparatus has been shown. This consists of two binding-posts 15 and 16, included in the alarm-circuit and arranged to be connected to complete the circuit by means of a blade 17, pivoted to one post and adapted to engage the other. The blade is held by means of a spring 18 against a block 19, secured to a flexible diaphragm 20. The under side of the diaphragm is subjected to the pressure of the water in the chamber 1 through a pipe 21. There is a small vent 22 in said pipe, forming an escape for the air in chamber 1 as the water rises in said chamber. When the water has filled the chamber 1, it rises in the pipe 21, and when the discharge is closed the diaphragm 20 is subjected to the pressure of the system and is operated to close the alarm-circuit and operate the alarm.

With the above construction the successive and frequent opening and closing of the valve 5 under the effect of water-hammer or

for any reason will not cause an accumulation of water in the chamber 1 sufficient to operate the alarm, for the reason that the water which accumulates while the valve 5 is open is quickly discharged when said valve closes. When there is a continuous flow of water from the system above the valve, however, there is a practically continuous flow of water past said valve and also through the pipe 2, and the accumulation in the chamber 1 will continue until it is sufficient to operate the diaphragm 11 and cause an alarm to operate.

In Fig. 3 a somewhat-modified construction of the devices for increasing the ratio between the supply and discharge is shown. In this construction the discharge is formed by a pipe 23, and the valve 24, which is arranged to close the discharge, is secured to the end of a rod 25, sliding through a boss 26 on said pipe. When the accumulation of water in chamber 1 has reached a certain amount, it acts to lift a float 27, secured to the end of rod 25, lifting the valve 24 and closing the discharge, thus increasing the ratio between the supply and discharge and causing an alarm to be operated, as in the previously-described construction.

In Fig. 4 is shown a construction in which the ratio between the area of the supply and the area of the discharge is increased by increasing the area of the supply, the area of the discharge remaining the same. In this construction the pipe 2 from the system communicates with a short pipe 28, extending up into the chamber and having an opening 29 in its upper end. The pipe also has a number of openings 30 in its sides, which are normally closed by a valve-ring 31. The ring 31 is secured to a diaphragm 32, which forms the bottom of chamber 1 and supports the water therein. When the diaphragm is depressed by the accumulation of water in the chamber, the openings 30 are uncovered, thus increasing the area of the supply to the chamber 1 and increasing the flow of water thereto or the pressure therein. This increase in flow or pressure causes the alarm to be operated, as in the construction first described.

While the apparatus described is especially designed and intended for use in connection with alarm devices for automatic sprinkler systems and its advantages have been set forth in connection with such apparatus and systems, yet it will be understood that the invention is not limited to use in such connections and that devices other than alarms might be operated by the increased flow or pressure produced in the receiving-chamber and that the invention might be used in connection with supply systems other than sprinkler systems.

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

1. The combination with a receiving-chamber, of a normally closed supply-passage between said chamber and a water-supply system, a discharge-opening out of said chamber, and means for increasing the ratio between the supply and discharge whenever the supply-passage remains open a predetermined time.

2. The combination with a receiving-chamber, of a normally closed supply-passage between said chamber and a water-supply system, a discharge-opening out of said chamber proportioned to cause a differential accumulation of water in said chamber when said passage is open, and means for increasing the ratio between the supply and discharge when said accumulation reaches a predetermined amount.

3. The combination with a receiving-chamber, of a normally closed supply-passage between said chamber and a water-supply system, a discharge-opening out of said chamber proportioned to cause a differential accumulation of water in said chamber when said passage is open, and means operated by said accumulation for increasing the ratio between the supply and discharge for said chamber.

4. The combination with a receiving-chamber communicating with a water-supply system, of means operated by a variation in pressure in the system for closing said communication, a discharge-opening out of said chamber proportioned to cause a differential accumulation of water in said chamber when said communication is open, and means operated by said accumulation for increasing the ratio between the supply and discharge for said chamber.

5. The combination with a receiving-chamber, of a normally closed supply-passage between said chamber and a water-supply system, a discharge-opening out of said chamber proportioned to cause a differential accumulation of water in said chamber when said passage is open, and means operated by said accumulation for closing said discharge.

6. The combination with a receiving-chamber, of a normally closed supply-passage between said chamber and a water-supply system, a discharge-opening out of said chamber proportioned to cause a differential accumulation of water in said chamber when said passage is open, a diaphragm operated by said accumulation of water, and a device operated by said diaphragm for increasing the ratio between said supply and discharge for said chamber.

7. The combination with a receiving-chamber, of a normally closed supply-passage between said chamber and a water-supply system, a discharge-opening out of said chamber proportioned to cause a differential accumulation of water in said chamber, a movable member operated by said accumulation of water, a valve operated by the movement of said movable member to close said discharge.

8. The combination of a receiving-chamber having a supply and a discharge proportioned to cause a differential accumulation of water

in said chamber, and means operated by said accumulation for varying the ratio between said supply and discharge.

9. The combination of a receiving-chamber having a supply and discharge proportioned to cause a differential accumulation of water in said chamber, a yielding diaphragm operated by said accumulation of water, and means operated by said diaphragm for varying the ratio between the supply and discharge for said chamber.

10. The combination of a receiving-chamber having a supply and discharge proportioned to cause a differential accumulation of water in said chamber, a diaphragm forming the bottom of said chamber, and a valve connected with said diaphragm for varying the ratio between the supply and discharge.

FREDERICK GRINNELL.

Witnesses:
IRA L. FISH,
R. A. BATES.