Feb. 18, 1947. A. SHAFF 2,416,025

ANTI-WATER HAMMER DEVICE

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Fig.1.

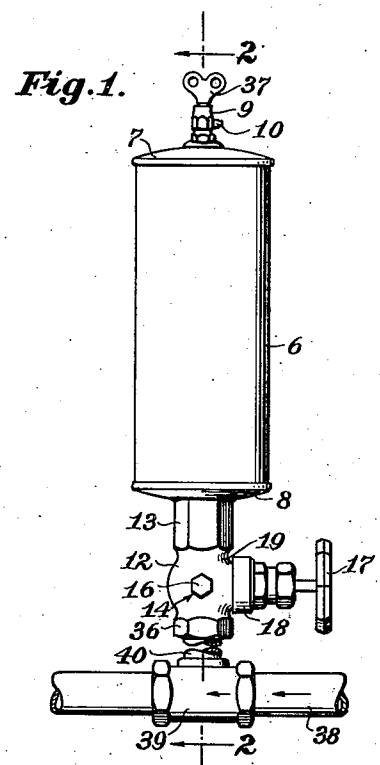


Fig.2.

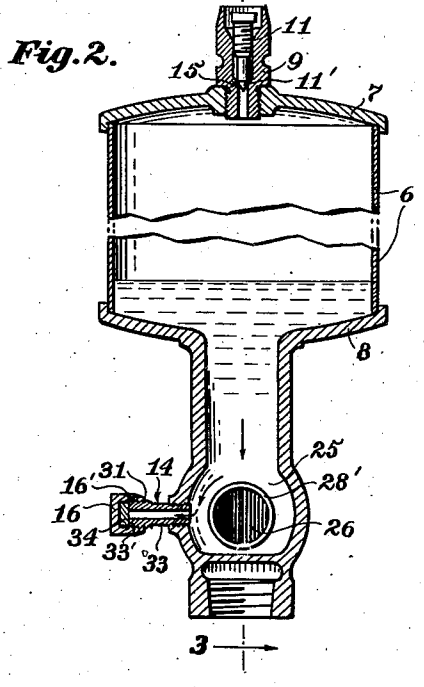
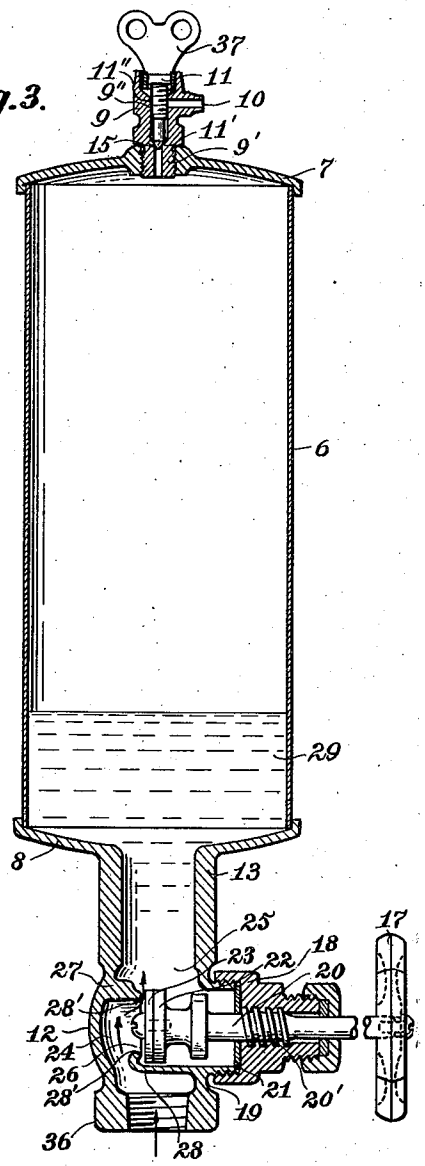


Fig.3.



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ANTI-WATER-HAMMER DEVICE

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1 Claim. (Cl. 138—26)

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My invention relates to devices for eliminating the pounding phenomena observed in water systems, popularly known as "water hammering." This phenomena is the result of a disturbance more or less violent which takes place in water pipes from the sudden closing of the taps or valves in the system. The sudden closing, stops the onrushing water in the system, and the energy of the moving water expiates itself in producing a water hammer which is annoying, as well as damaging to the water pipe system. The resulting strain tends to loosen fittings and connections and sometimes produces a breaking in the system.

It is known in the art that the water hammer and its effects may, in a measure, be mitigated by providing at some preferred point in the system a sealed air chamber, connecting with the pipes of the system itself; the air in the air chamber acting as a cushion or shock absorber, permitting the onrushing water, when the tap or valve is suddenly closed, to spend its momentum in compressing the air of the air chamber.

In devices of this character, it is important that for the continuous and efficient working of the air chamber that it contain an adequate air cushion at all times.

In the current practice in the art, however, the air cushion in the course of use is relatively quickly absorbed or entrapped in the water of the system, rendering the air chamber ineffective to prevent water hammering. The air chamber becomes water logged, the water in the system gradually rising to fill it and replacing the air cushion which is essential to practical use. In current devices, it is necessary to completely remove the same frequently, and either replace the same, or to recondition the same for further use. This necessitates the use of skilled plumbing help and consequent expense and the temporary closing of the water supply with resulting inconvenience.

My invention has for its object the provision of means for cushioning and absorbing the shock produced by the water phenomenon known as "water hammering," in which means are provided for assuring an adequate air cushion in the air chamber under all circumstances of use.

Another object of my invention is to provide a device containing an air chamber, with means for easily replenishing the air which may be absorbed or entrapped therefrom in use, without the need of removing the device.

Another object of my invention is to provide an improved device of the kind mentioned, in which

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the air cushion in the air chamber may be readily and quickly replenished when dissipated, without the need of removing the device or stopping the flow of water in the system.

Another object of my invention is to provide a simple device of the kind in question which may be readily and quickly reconditioned for use by the average householder without resort to skilled plumbing help.

My invention also has for its object such other advantages as hereinafter are made to appear.

It will be obvious to those versed in the art to which my invention relates that the same may be incorporated in several different constructions. The accompanying drawing is submitted therefore for the purpose of showing the preferred embodiment of my invention whereby the disadvantages current in the art may be obviated in which Fig. 1 is an elevated view in perspective showing the combination of parts entering into my invention. Fig. 2 is a fragmentary and enlarged section of Fig. 1, taken along line 2—2, viewed in the direction of the arrow, showing the air intake valve, and the water drain valve in section. Fig. 3 is a section in elevation of Fig. 2, taken along line 3—3 of Fig. 2, viewed in the direction of the arrow, showing the water intake valve and air intake valve in section.

Similar numerals refer to similar parts throughout the several views.

My invention is also in the combination and arrangement of parts and in the construction as herein set forth and claimed.

Referring more particularly to the drawing, Fig. 1 represents an anti-water hammer device embodying my invention in perspective showing the relation of the various parts. The device has an air chamber 6, sealed at the top by cap 7 and at the bottom by cap 8. The air chamber and associated parts are preferably made of brass or bronze but any other type of material may be used provided it is capable of withstanding the pressures of the water systems to which it is applied. Leading into the air chamber is valve 9, having its inlet 9', affixed airtight to cap 7, and its outlet 10. Valve key 11 operates to open and close valve 9. Leading into the air chamber through the bottom cap 8, is valve 12, having its inlet 13, affixed airtight to cap 8. Valve key 17 serves to open and close valve 12. Leading out of valve 12 is drain valve 14, it being secured airtight to valve 12. Turn cap 16 serves to shut and open drain valve 14.

In Fig. 3 the air inlet valve 9 is shown in detail. At its end it enters air chamber 6 through

neck 9'. The upper part of neck 9' is shaped concave to form a valve seat 15, to receive the lower corresponding concave end 11' of valve key 11. Valve key 11 is threaded at 11'', and is screwed into corresponding threads cut in the upper portion of the bore of valve 9.

Valve key 11 is square shaped at its top to receive key 37 which is adapted to screw valve key 11 to fit tight into valve seat 15 when the valve is to be closed, and to unscrew valve key 11 away from seat 15 when the valve is to be open.

The water inlet valve 12 is a modified globe valve, adapted to the objects of the invention. Its body is securely and airtightedly affixed to the bottom cap 8. Valve 12 has a neck 13. End 36 is threaded and adapted to be connected on to the water system 38, one means of connection being shown as comprising threaded pipe 40 and "T" connection 39. Within the valve body 12 and integral therewith are walls 27 and 28 dividing the valve body into sections 24 and 25, each opening into the other through a circular aperture 26. The walls 27 and 28 constitute one continuous dividing section in the center of which is aperture 26. The area of walls 27 and 28 adjacent the aperture are ground to form a continuous valve seat 28', which is adapted to receive valve key 20. Valve key 20 terminates in an enlarged section 22 adapted to receive securely a washer 23. The valve key 20, is enlarged to form a threaded portion 20' which screws in and out of corresponding threads in casing 18 which surrounds and keeps valve key 20 in position. Casing 18 is screwed onto neck 19 of valve body 12 to form a water tight joint, and the key passing through casing 18 is packed to render the casing surrounding it water tight. By operation of wheel 17 affixed to valve key 20, washer 23 is brought to bear against valve seat 28' closing aperture 26, or is removed therefrom to open said aperture permitting the water supply to be cut off or to enter the air chamber. When the valve is closed the water from the water system 38 enters section 24 of valve body 12, being completely shut off from the air chamber. When valve is open the water in the water system 38 rises further passing through the aperture 26, enters section 25, and continues to rise in air chamber 6 until the pressure reaction of the air enclosed in the air chamber becomes equal to the water pressure. In Fig. 3 the water is shown as 29.

In Fig. 2, there is shown the parts of drain valve 14 and its relation to the water inlet valve 12. A cross section along line 2—2 of Fig. 1 is shown. Drain valve 14 enters into valve 12, through a hollow neck 33 which is secured into the body of valve 14 airtight and opens into section 25 of valve body 12. Neck 33, bears threads 31, and its end is ground smooth to serve as a valve seat 33'. Turn cap 16 is threaded within, the thread corresponding to threads 31, being adapted to screw on to the threaded portion of neck 33. The inside of turn cap 16 is ground flat and adapted to correspond with valve seat 33' when screwed down against valve seat 33' to form an air tight valve. Washer 34 serves to assure a water tight valve. Turn cap 16 has bored through its side aperture 16'. When turn cap 16 is unscrewed away from valve seat 33' sufficiently the valve is opened and water is permitted to pass through neck 33 and to drain out of aperture 16'.

In operation my invention functions in the following manner. At a chosen point in the water system 38, my device is affixed, one way of affixing the same being shown in Figure 1. The water inlet valve 12 and drain valve 14 are each securely closed, and the air intake valve 9 is open prior to affixing the device to the water system.

To place the device in operation key 37 is turned to securely close air intake valve 9, air chamber 6 being full with air at atmospheric pressure. Then valve 12 is opened and the water in the water system 38 enters through section 24, passes through aperture 26, then into section 25, and rises in the air chamber until the air pressure in the air chamber balances the water pressure. The result is an air cushion in the air chamber. The device is now part of the water system and is adapted to obviate water hammering and to readily furnish under all circumstances of use a readily available air cushion, easily and quickly replenished when diminished by water absorption or other means. There is no need for removing the device once affixed, the air being replenished by the simple arrangement of parts as disclosed.

In the course of use of my invention when water hammering is again noted, it is indicative of a need for more air in the air chamber, that in the course of use the air has been absorbed or entrapped so that there is not a sufficient air cushion to operate as a shock absorber. In that event my invention permits the following means of replenishing the air cushion without disturbing the flow of water in the system itself and without the need of removing the device nor the need of skilled adjustment. The device may by my simple arrangement of parts be put into use within a few minutes whereas in the current art, a considerable length of time will elapse before other devices can be readjusted to use again.

In restoring my device to its original state, I first close valve 12 by turning key 20 by means of wheel 17 against valve seat 28', closing aperture 26. This shuts off the water from the air chamber 6. I then open drain valve 14 by unscrewing cap 16, and open air valve 9. The action of these two valve openings is to permit the water to quickly drain out of the air chamber. When completely drained, which is a matter of a few minutes, I close valve 14, airtight again and then close valve 9 airtight. This leaves the air chamber full of air at atmospheric pressure as originally. I then open valve 12 permitting the water in the water system to again rise into the air chamber until the reaction of the air under pressure equals the water pressure. A sufficient air cushion results. The device is again ready for normal use. It is thus apparent what advantageous purposes my invention serves, and the ease with which it may be made to function over a long period of time, under all circumstances of use.

It will be obvious to those skilled in the art to which my invention relates that the same may be made in several different constructions although my invention is described with a great degree of particularity. My showing is to exemplify merely the preferred embodiment of my invention. For example, in place of the globe valve used as a water intake valve, a gate valve or similar valve may be used, and in place of the needle valve used for air intake or the drain valve as shown, other valves may be used without departing from the essence of my invention.

Various changes in the form, properties, and the details of construction may be resorted to without departing from the principle of sacrificing any of the advantages of this invention.

Having thus described my invention, I claim:

A device for eliminating water hammer in systems conducting fluids under pressure, having an air chamber and an air cushion therein; means adapted for affixing the air chamber to said system; valve means comprising a valve seat, and a valve key to operate said valve, sealed to and opening into said air chamber, adapted for making said air chamber accessible to the fluid in said system, to permit said fluid to enter said air chamber and compress the air cushion therein, under normal circumstances of use, and adapted to shut off said air chamber from the fluid in said system when the air cushion therein is to be replenished; valve means, comprising a valve seat, and a valve key to operate said valve, sealed to and opening into the upper portion of said air chamber, adapted to allow the air from without to communicate with the air within said air chamber when said air chamber remains shut off

from said system; and valve means, comprising a valve seat, and a valve key to operate said valve communicating with said air chamber, adapted for readily draining the fluid from said air chamber to allow such entry of air from without into the air chamber to replenish the air cushion therein, whereby all of the advantages of the invention are attained.

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