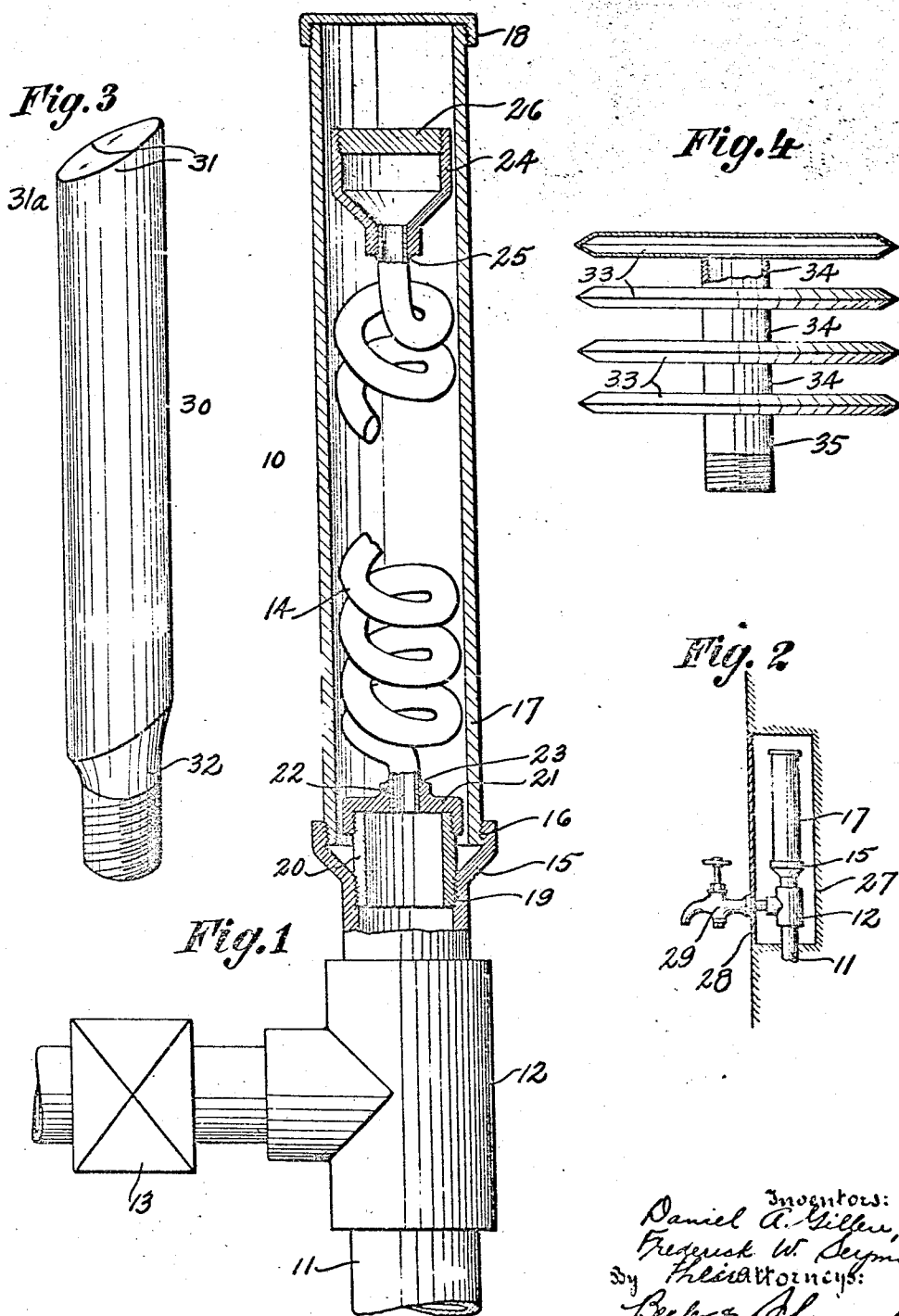


WATER SHOULD ABSORB

Filed March 23, 1929



UNITED STATES PATENT OFFICE

DANIEL A. GILLEN AND FREDERICK W. SEYMOUR, OF FLUSHING, NEW YORK

WATER SHOCK ABSORBER

Application filed March 23, 1929. Serial No. 349,345.

This invention relates to devices for eliminating water hammer from piping systems.

One object of the invention is to provide a device of the character described having improved cushioning means to eliminate water hammer from a piping system, which cushioning means shall be of a permanent nature, and simple and efficient in operation.

Another object of the invention is the provision of a device of the nature set forth having improved metallic means that gives under the high and low pressure caused by the hammering action that is incident to the sudden checking of the flow of water in a pipe, and automatically returns to initial position when the hammering subsides.

Another object of the invention is to provide a device of the type specified having improved means for maintaining an air cushion, which means includes a long length of tubing of smaller cross section than the communicating piping system so that the air cushion will not be dissipated by the water.

Another object of the invention is to furnish a device of the nature alluded to in which the said tubing is of such form as to give, causing a frictional retardation of the pressure wave therein, the tubing being preferably of a helical form.

Another object of this invention is to provide a device that shall prevent the waste of water by leakage at the washers of the faucets, this being obviated by efficient elimination of the water hammer.

A further object of the invention is to construct a device of the type mentioned having improved metallic cushioning means that is instantly responsive to the hammering in the pipe, and which is simple and reliable in construction, inexpensive to manufacture, and adapted for long and continuous use.

Other objects and advantages of the invention will become apparent as the specification proceeds.

With the aforesaid objects in view, the invention consists in the novel combinations and arrangements of parts hereinafter described in their preferred embodiments, pointed out in the subjoined claims, and illustrated on the annexed drawing, wherein like

parts are designated by the same reference characters throughout the several views.

In the drawings:

Figure 1 is a view in vertical section of a device embodying the invention.

Fig. 2 is a view in side elevation showing a typical application of the same.

Fig. 3 is a perspective view showing a modification of the invention.

Fig. 4 is a view in side elevation of a further modification of the invention, with a part removed to show the interior construction.

The expression "water hammer" used herein is that phenomenon which occurs in piping systems for water supply, and is caused by the building up of pressure in proportion to the time which it takes to stop the flow of water through a pipe by the closing of a faucet or valve. When water is flowing through a faucet or valve and is suddenly shut off, a pressure is built up at this point, which in pounds per square inch, may be between fifty and sixty times the velocity of the water in feet per second. In some instances a pressure as high as five hundred pounds is created, depending upon the quickness of the faucet shut off. The water being suddenly arrested on the valve or faucet, accumulates energy that is stored in the water and pipe at this point. As this energy is stored in the water, and also in the pipe to a limited degree, the water is compressed slightly and the pipe gives slightly. The stored energy in the water and pipe as the flow is arrested, in order to relieve the compression of the water and the give of the pipe, reacts in reverse direction against the head of water and sends a rebound of energy back through the piping and the water toward the source of supply. This energy that is stored up against the source of supply in pipes reacts again and another high pressure wave is sent against the faucet, piping, and so forth, the same as generated when the faucet is first closed. And so this rebound cycle is repeated until the undue pressure is dissipated by friction against the pipes, fixtures, and fittings, and the give thereof until normal pressure is reached. The water ham-

mer effect places a strain on the piping system and acts in all directions in its effort to attain a normal static condition. As the water acts with pressure it strains the fittings and pipes. This invention provides a spring or give fitting which will take the strain from the piping system and dissipate the undue pressure in a manner that will relieve the piping system, fittings, and fixtures, and prevent wear and leaks, and eliminate noise or water hammer.

It is found that the air cushions at present used, and which are provided by nipples or piping extensions are quickly dissipated and rendered ineffective due to absorption of air by the water, as well as the effect of the water in entraining air. By this invention this condition is obviated.

The advantages of the invention as here outlined are best realized when all of its features and instrumentalities are combined in one and the same structure, but, useful devices may be produced embodying less than the whole.

It will be obvious to those skilled in the art to which this invention appertains, that the same may be incorporated in several different constructions. The accompanying drawing, therefore, is submitted merely as showing the preferred exemplification of the invention.

Generally described, the invention provides a cushioning device which is made of any suitable elastic material. This material is preferably any metal, which may be preferably an alloy, such as brass, bronze, or Monel metal, that can be easily bent and formed, and yet possesses sufficient elasticity for the required cushioning. The form or contour of the device is such that it can respond to an increase or decrease of pressure. Within the scope of the invention, the same is applicable whether this pressure be applied interiorly or exteriorly of the device, as will be readily apparent. Since the device includes a tubular member of small cross section, the area of contact therein between the air cushion and the water is reduced so that the air cushion will not be dissipated by the water. Additional cushioning action is afforded by the give of the tubular member and by frictional resistance therein to the water. Since the device is made of metal, it can be used indefinitely without replacement, and yet function with uniform reliability at all times. It can be made up very compactly and concealed in an out of the way place, or in the wall of the building. A suitable casing may enclose and protect the expansible member. An air chamber may be connected to the upper end of the tubular member to act in conjunction therewith and afford additional cushioning for the piping system.

Referring in detail to the drawing, 10 denotes a device embodying the invention.

The same includes any suitable piping system 11 for conveying water, the said piping system having an elbow or T 12 in proximity to which is a valve or faucet 13 that is of a quick-acting type so that when the valve is closed, water hammer is generated. The water hammer consists of a series of pulsations that act with tremendous pressure and spread throughout the piping system, creating noise, and subjecting the system to great stress and wear.

Communicating with the piping system so as to be subject to the pressure therein is a resilient air cushion member 14 which is preferably made of a metal and is of such conformation as to change its initial shape when subjected to undue pressure with the result that the member will give and thus avoid water hammer. The means whereby the member 14 is connected to the piping system may assume various forms, and one possible arrangement is shown herein. This arrangement includes a reducing fitting 15 which is threaded into the upper end of the T. At its larger end the reducing fitting is internally threaded at 16 to receive a casing 17 that surrounds the member 14 and protects the same. The upper end of the casing 17 may be closed by a threaded cap 18. The small end portion of the reducing fitting 15 is internally threaded at 19 to engage a nipple 20 onto which is threaded a cap or bushing 21. The latter has a central opening 22 to receive the lower end of the member 14. Since the expansible member 14 is preferably made of brass, bronze, Monel metal, or another alloy, the bushing 21 may be made of like material, and the joint at 22 rendered tight in any suitable manner, preferably by brazing at 23. The casing 17 is air tight and can be filled with fluid at any desired pressure.

The member 14 is of considerably smaller area than the piping system to reduce the area of contact therein of the air cushion and the water. An air cushion compartment may be connected to the top of the member as hereinafter described. In any case the dissipation of the air cushion by the water is eliminated. Due to the resilient nature of the member, the same will give under undue and decreased pressure, thus also creating a frictional retardation of the pulsating wave. These factors will combine to obviate water hammer.

The member 14 may be rendered responsive to the hammering pressures of the piping system by being formed in the nature of a helical coil which extends in any suitable direction and will nevertheless change its shape to afford slight increased capacity for the reception of water from the piping system and will spring and give as the pressure is applied and retarded. In the particular shape of the member 14 it will in-

crease the diameter slightly, but primarily it will elongate. At its upper end the tubular member 14 may be sealed in any suitable manner, or a compartment 24 forming an air cushion may be connected thereto, and movable as the helical coil gives. The said compartment 24 can be made in the form of a fitting of brass or the like that is brazed to the tubular member 25, while the upper end of the same is closed as, for example, by means of a plug 26. The air cushion in the compartment can not be dissipated because it is protected by the long helical coil tube. The cushion in the said compartment adds to the efficiency of the device as a whole, and also tends to an increase in the frictional retardation in the helical member.

In the normal operation of the device, when the valve 13 is closed, water hammer is created, but acts interiorly on the tube 14 and causes the same to increase in its volumetric capacity and shape and position. This is a characteristic which is well known in connection with coil or deformed hollow members. Although the air cushioning compartment 24 is provided, it will be appreciated that the device could function equally well without the same. The nature of the material of which the coil is made, or the thickness thereof, can be made of such relation that the expansible member will respond to water hammer, and will be unaffected by the pressures that normally exist in the piping system.

The invention thus constitutes a compact unit that can be readily mounted in any installation as, for example, by being positioned within a recess 27 in the wall of a building, which recess can be comparatively small and narrow, and can be closed in any suitable manner by means of masonry or by means of a plate 28 at the outside of which is a faucet 29 that is connected to the T 12.

In Fig. 3 is shown a modification of the tubular member 14, the same constituting a single tube 30 that is flattened in cross section and with the sides 31 thereof substantially straight. The upper end of this tube 30 may be closed at 31a in any suitable manner by soldering or brazing. The lower end of the tube terminates in a circular nipple 32 that is threaded so that it may directly engage the thread 19 in the reducing fitting 15. The member 30 may be variously made and can be rolled out from a circular tube of the proper material, whether of bronze, brass, or other alloy.

In Fig. 4 is shown a still further modification of an expansible device, the same comprising a plurality of elements 33 that are all hollow and of disk like form. These elements 33 are in alinement with one another and interconnected by tubes 34 positioned

therebetween and secured to the elements in any suitable manner as, for example, by brazing or by means of threaded connections. Then all of the elements 33 intercommunicate with themselves and with a lowermost nipple 35 that may be directly connected to the piping system in any suitable manner. This element can be of the one-piece type machined in shape somewhat in the manner that flexible hollow tube is made except that the stretching of the tube is in the same horizontal plane rather than in a progressive convolution.

We have found in practice that an expansible element constructed as indicated herein, will function with a high degree of efficiency in eliminating water hammer, or the like. We have found that where the present type of air cushions are employed that the same after a certain period of use, are of extremely limited volume. After the lapse of a considerable period of use, however, the present air cushions have been totally destroyed, whereas by the use of our invention as herein described, a cushion of indefinite life is provided.

It will thus be seen that we have provided a device which fulfills the several objects of the invention and which is well adapted to meet the requirements of practical use.

We claim:

1. A device to eliminate water hammer, or the like, including a resilient metallic member, and a piping system to which the same is connected, the said member having such a conformation as to yield under the pressure of water hammer to afford a cushioning action, and an air cushion chamber connected to the member and carried thereby.

2. A device to eliminate water hammer, or the like, said device including a piping system, a resilient metallic tubular coil member subject to the pressure in the system, said member being of such conformation and having such resilience as to respond to the pressures generated by water hammer, but to be unaffected by substantially normal pressures in the system, said member being vertical and communicating at its lower end with the piping system, and a compartment forming an air cushion carried by the upper end of the member and communicating therewith.

3. A device to eliminate water hammer, including a piping system having a quick-closing valve, an air cushion chamber, and a tubular coil connecting the chamber and the piping system at a point in proximity to said valve, and a housing enclosing the chamber and the coil.

4. A device as set forth in claim 3, wherein the coil is helical and the chamber is alined therewith.

5. A device to eliminate water hammer, or the like, said device including a piping system, and a resilient metallic member subject

4
to the pressure in the system, said member
being of such conformation and having such
resilience as to respond to the increased and
decreased pressures generated by water ham-
5 mer, but to be unaffected by substantially nor-
mal pressures in the system, and an air cush-
ion chamber of relatively large diameter con-
nected to the member, a casing enclosing the
member, and constituting a guide for the air
10 cushion chamber.

In testimony whereof we affix our signa-
tures.

DANIEL A. GILLEN.
FREDERICK W. SEYMOUR.

15
20
25
30
35
40
45
50
55
60