May 13, 1941. G. C. CRANGLE 2,241,541

PULSATOR AND THE LIKE

Filed Aug. 20, 1938

Fig. 2

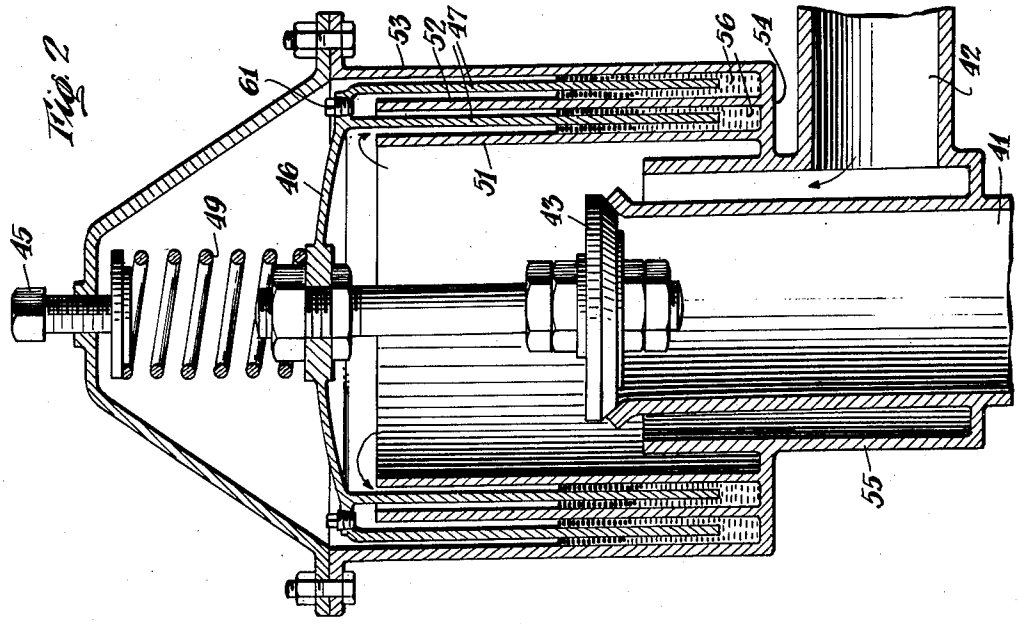
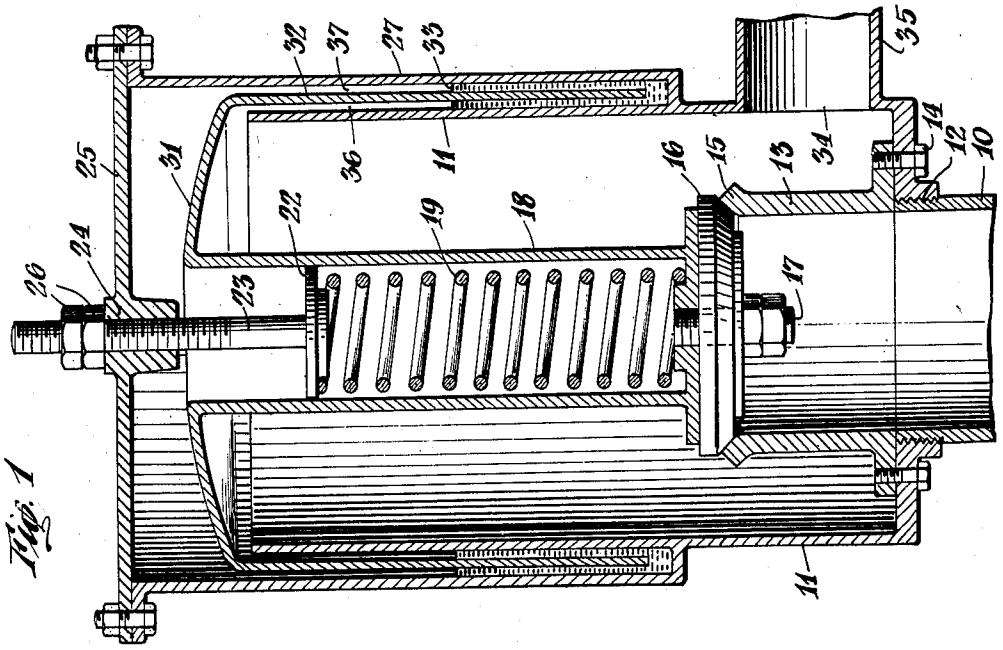


Fig. 1



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PULSATOR AND THE LIKE

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5 Claims. (Cl. 259—1)

This invention relates generally to what are known as pulsators and one of its objects is to provide an improvement of the pulsatory mechanism which is shown in United States Patents Nos. 1,789,516 and 1,865,745, issued January 20, 1931 and July 5, 1932, respectively, to the present applicant.

The pulsator of the present application is adapted to serve all of the purposes of the pulsators in the two patents above mentioned. In fact, the pulsator of the present application can be employed wherever the prior pulsators referred to can be used and with better results.

Another object of the present invention is to provide a pulsator construction which can be operated over a long period of time without repairs or replacement of parts.

Still another object is to provide a pulsator construction which is capable of regulation to a greater degree according to the amount of operating pressure applied to the device or, to state it in another way, the work to be done by the pulsator can be controlled with greater nicety by the construction herein shown and described.

In the following specification and the drawing referred to in the specification, only the pulsator mechanism is shown. It will readily be understood, however, that this mechanism can be connected to any other mechanism where a pulsating or jigging effect is desired.

More specifically, and as an ancillary object, the invention provides a seal for the pulsating element which will yieldingly confine the pressure which operates the pulsator.

With the foregoing and other objects in view, the invention consists in a novel construction and arrangement of parts, the novel features of which are pointed out in the claims hereof and the principles of which are illustrated in the drawing accompanying and forming a part of this specification.

In said drawing:

Fig. 1 is a section through one of the novel pulsators which is highly satisfactory for operation under what may be termed a low head of pressure.

Fig. 2 is a section through another form of the pulsator which is adapted to operate upon a high head of pressure or to do heavier work than the construction shown in Fig. 1.

The apparatus shown in Fig. 1 may be supported in any desirable way and connected by means of the tubular outlet 10 with the work which is to be done. The parts are all shown in Fig. 1 in the positions they occupy when the device has been assembled for operation. These parts include a shell 11 which is threaded on at 12 to the upper end of the tubular outlet 10 and a member 13 which is secured above and within the shell 11 by bolts 14. The member 13 is flared outwardly or otherwise suitably formed, as shown at 15, to provide a valve seat cooperating with a valve closure 16. This valve closure is secured by means of a bolt 17 to the lower end of a tubular member 18. Within the tubular member 18 is a compression spring 19 cooperating at its upper end with a keeper 22 on the lower end of a bolt 23 which is threaded into a part 24 carried by a top frame member 25. The bolt 23 can be adjusted to regulate the tension of the spring 19 and then is secured in adjusted position by the locking nuts 26.

The shell 11 is provided with an outer shell 27 closed at the bottom to provide an annular receptacle which has spaced apart and substantially parallel or concentric walls. The purpose of this will be explained later on.

Rigid with the tubular member 18 carrying the valve closure 16 is a bell having a closed top 31 and tubular or cylindrical side walls 32 inserted between the concentric walls 11 and 27 and occupying the position shown in the drawing before an operation is started.

The annular receptacle is filled with mercury 33 in sufficient quantity to extend slightly more than half the depth of the annular receptacle when the walls of the bell have been lowered into the receptacle. When the operating pressure is applied under the closed top 31, as hereinafter explained, an air cushion will, if water is employed, be formed under the top of the bell and above the pressure head of water.

The inlet for the operating pressure is shown at 34. A conduit or pipe 35 is connected to a source of water operating under a pressure head or the pipe or conduit may be connected to a source of pneumatic pressure if one is available.

In the operation of the apparatus of Fig. 1, the pressure medium entering at 34 will lift the bell 31 against the tension of the spring 19 until the pressure becomes sufficient to unseat the valve closure 16. This will allow the pressure medium to escape and the spring 19 will thereupon reseat the valve closure 16. As the pressure builds up the mercury will be partially driven out of the side 36 of the annular receptacle and up in the side 37 of the receptacle, that is, around the lower edge of the wall 32 of the bell. The amount of mercury and the height to which it is driven by the pressure will, of course,

depend upon the use and consequent size of the apparatus but in all forms it is necessary to supply an amount of mercury which will confine the pressure in the bell without allowing any escape of pressure under the lower edge or rim of the bell.

When the valve closure is unseated and the pressure escapes, the mercury will flow back around the lower edge or rim of the bell ready for the next pressure operation. In other words, the mercury has a pulsating effect in the receptacle but is at all times effective to maintain a perfect and quickly responsive seal.

The apparatus of Fig. 2 may, so far as the spring mechanism is concerned and in fact in some other respects, be the same as the apparatus shown in Fig. 1. However, the apparatus in Fig. 2 is so constructed that more mercury can be used to effect a yielding sealing of the pressure or a lower column of mercury to get the desired effect.

The apparatus of Fig. 2 has an outlet 41 and a pressure inlet 42 which are the same in arrangement and purpose as the corresponding parts shown in Fig. 1. The same form of valve closure 43 is employed and a spring 49, which may be quite heavy, used for seating the valve closure on the valve seat. A tension adjustment 45 for the spring is also used.

The bell for confining the pressure for intermittent operation has a closed top 46 and double walls 47 which are substantially parallel or concentric. These walls are inserted between walls 51, 52 and 53 which are likewise substantially parallel or concentric and extend upward from a bottom 54 attached to the exterior of a casing member 55. This construction forms a double annular receptacle made up of spaced apart concentric walls and these recetpacles are filled with mercury 56 to substantially half of their depth. When the bell and its side walls are lowered into the receptacle vent plugs 61 are opened to provide escape of the air which would otherwise be trapped between the two walls of the bell. The remaining air may be employed to serve as, what might be called, an operating medium to transmit movement of the mercury between the walls 51 and 52 over the top of the wall 42 to the mercury between the walls 52 and 53. However, the preferred practice is to fill the two concentric receptacles 56 with water after the proper amount of mercury has been employed so that when the vent plugs are open and the bell lowered the space above the mercury between the walls 47 of the bell will be filled with water. After the vent plugs 61 are closed, there is therefore, a suitable and substantially incompressible medium for permitting the mercury movement from one receptacle to the other.

It should be made clear that the mercury in the outer bell 33 of Fig. 1 and the outer bell of the receptacle 56 is open to the air so that the pressure applied within the bell will lift the mercury against atmospheric pressure only and will consequently be free to return immediately when the pressure is relieved.

The operation of the apparatus of Fig. 2 is obvious from what has been hereinbefore stated and it will be apparent that what may be termed the double seal for yieldingly holding the pressure will enable the use of greater pressures than is possible with a single seal unless a high column of mercury is used with the single seal construction.

The apparatus in Fig. 2, like that in Fig. 1, also is arranged to provide a permanent air cushion under the top of the bell and return of the mercury is against air, although the device works quite well even if water is forced over the top and into the inner division of the mercury-containing chamber.

From all of the foregoing it is apparent that the apparatus shown and described is a simple one in construction and it is capable of operation without attention over long periods of time. There are no diaphragms to wear out or rupture and the whole construction is such that there is little friction at any point of a nature which will cause wear or mechanical trouble.

While the apparatuses as shown and described are admirably adapted to fulfill the intended purpose, it is apparent that they may be modified and changed in many respects including changes in the construction and relative arrangement of parts, all coming within the scope of the claims which follow.

What is claimed is:

1. In a pulsator apparatus, an annular receptacle having spaced apart substantially concentric walls, a bell having its side wall between the walls of the annular receptacle, means for effecting a relative movement of the bell and the receptacle in one direction by applying pressure under the bell, means including a return spring to effect relative movement of the receptacle and the bell in the opposite direction, a valve closure rigid with the bell cooperating with a stationary valve seat, and mercury in the annular receptacle in sufficient quantity to yieldingly seal the mouth of the bell during said relative movements.

2. In a pulsator, an annular receptacle having spaced apart substantially concentric walls, a bell having a vertical wall between the walls of the receptacle, a valve closure under and moving with the bell, a passage comprising a valve seat with which said closure cooperates, a spring yieldingly holding the bell and closure down with the closure on the valve seat, means for applying pressure under the bell to overcome the spring to lift the bell and closure and thereby relieve the pressure within the bell, the spring thereupon reseating the valve closure on the valve seat, and mercury between the walls of the receptacle in sufficient quantity to maintain a seal yieldingly confining the pressure under the bell until the bell and valve closure are lifted.

3. In an apparatus of the character described, an annular receptacle having a plurality of substantially concentric walls, a member closed at the top and having vertical portions inserted between said concentric walls, a valve closure moving with said member having a top of less area than the interior of the top of the member, a passage comprising a valve seat with which said closure cooperates, a spring yieldingly holding said member and the valve closure in position with the closure on the valve seat, means for applying pressure under the member to lift the member and valve closure against the tension of the spring and thereby relieve the pressure, the spring thereupon reseating the valve closure, and mercury in the receptacle and at both sides of the vertical portions of the member in sufficient quantity to maintain a seal yieldingly confining the pressure within said member.

4. In a pulsator apparatus, an annular receptacle having spaced apart substantially concentric walls, a bell having its side wall between the walls of the annular receptacle, means for applying pressure under the bell to effect a relative

movement of the bell and the receptacle in one direction, means including a return spring to effect relative movement of the receptacle and bell in the opposite direction, a valve closure rigid with the bell and cooperating with a stationary valve seat, means for adjusting the tension of the return spring and thereby the rapidity of the pulsations, and a fluid in the annular receptacle in sufficient quantity to yieldingly seal the mouth of the bell during said relative movements.

5. In a pulsator for purposes stated, an annular receptacle having a plurality of substantially concentric walls, a member closed at the top and having vertical portions inserted between said concentric walls, a valve closure rigid with said member having a top of less area than the interior of the top of the member, an outlet passage comprising a valve seat with which said closure cooperates, a spring yieldingly holding said member and the valve closure in position with the closure upon the valve seat, means for applying pressure under the member to lift the member and valve closure to raise the closure against the tension of the spring and thereby relieve the pressure, the spring thereupon reseating the valve closure, means for regulating the tension of the spring and a fluid in the annular receptacle and cooperating with the vertical portions of the aforesaid member in sufficient quantity to maintain a seal yieldingly confining the pressure within said member.

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