Nov. 29, 1938. B. DOUREDOURE 2,138,446

VALVE

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FIG. 1.

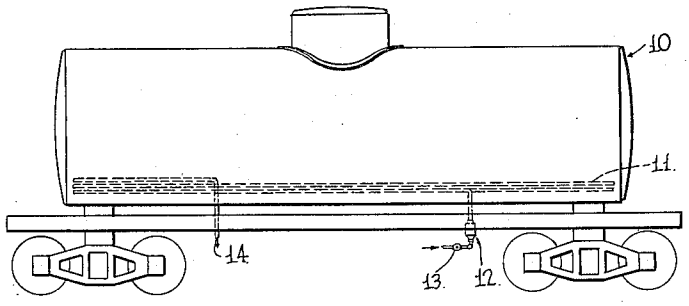


FIG. 2.

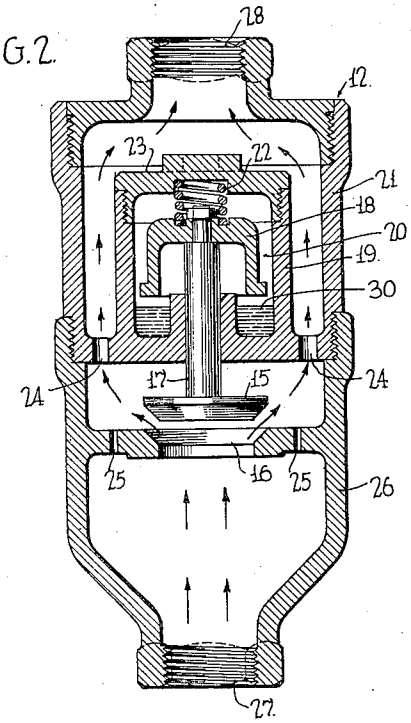


FIG. 3

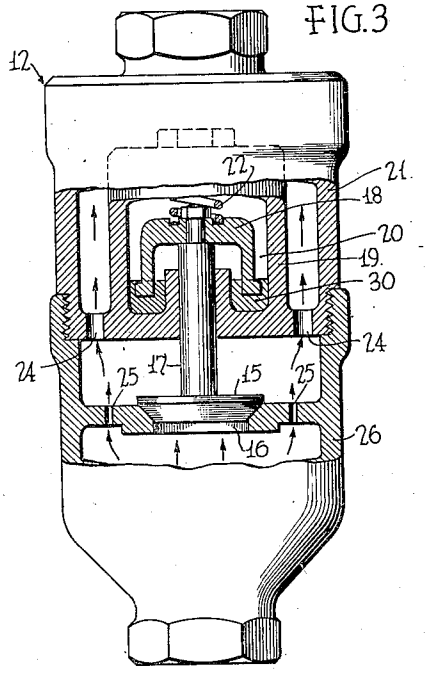
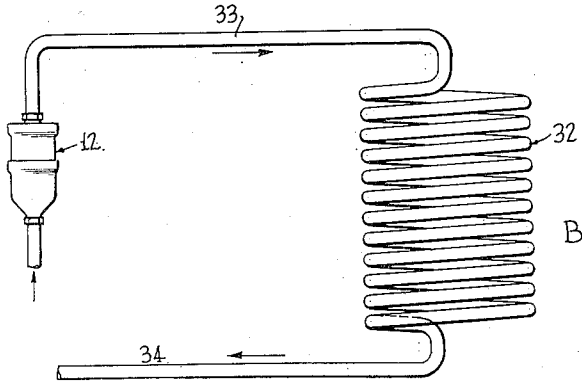


FIG. 4.



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VALVE

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8 Claims. (Cl. 137—161)

The present invention pertains to the art of valves and involves a valve which permits the flow of only a limited amount of fluid at relatively low pressure until a desired temperature condition has been attained in the conduit to which said fluid flows from the valve.

The purpose and advantages of the invention will be best understood from a consideration of problems arising in heat exchange systems and the manner in which these problems are solved by the invention. In a heating or cooling system which includes a coil or tubes, for example, it frequently occurs that the conduit for the heating or cooling fluid becomes clogged or obstructed by freezing of the heat exchange fluid or by the accumulation of foreign impurities. When a fluid is thereafter passed through the conduit under high pressure, this often causes breakage of the clogged or obstructed conduit. Thus, in the case of tank cars in which liquids are shipped, it frequently happens that ice forms in the steam coils during the winter months, and when steam is thereafter passed through the coils to heat the contents of the car, breakage occurs. One of the objects of the invention has been to devise a valve which obviates the danger of breakage when conditions of this kind arise.

A further object of the invention has been to devise a valve capable of automatically allowing the passage of only a limited quantity of fluid, at relatively low pressure, until a predetermined quantity of fluid has passed through or a predetermined temperature condition has been attained in the conduit controlled by the valve, and thereafter permitting the flow of fluid at a greatly increased capacity.

The invention will be best understood by a reading of the following detailed description in the light of the attached drawing in which

Fig. 1 illustrates the application of the valve of the invention to a heating coil of a tank car;

Fig. 2 is a detailed central cross-section through the valve of the invention illustrating the valve in its open position;

Fig. 3 is a view generally similar to Fig. 2 but illustrating the valve partly in side elevation with the valve in closed position;

Fig. 4 illustrates the application of the invention to a coil.

Referring to the drawing by reference characters, steam may be admitted to the tank car 10 by passage through a coil 11 to heat the contents of the tank car. The steam is admitted through the valve 12 of the invention by means of a manually controlled valve 13 and passes from the tank car after performing its heating function through the outlet conduit 14.

The valve 12 of the invention may comprise a valve plug 15 which co-operates with a valve seat 16 and is guided by a valve stem 17 which operates within a bearing in a housing 19. A cap 18 is secured to the upper end of the valve stem, and reciprocates with the valve stem within the wall 20 of the housing 19. The outer casing of the valve may be formed in sections as illustrated for the purpose of assembly and may consist of an upper section 21, a lower section 26 and a head 28 secured together in threaded relationship. The housing 19 may be formed integrally with the upper section 21 and is provided with a top member 23 which may be threadedly secured to the housing 19. A spring 22 may be interposed between the top of the cap 18 and the lower surface of the top member 23 as illustrated. The valve seat 16 is formed in a flange extending inwardly from the lower casing section 26, and the upper casing member 21 is provided with a horizontally extending base which forms a bearing for the valve stem 17. A plurality of relatively large openings 24 are provided in the base of the upper casing member 21 between the outer wall of that member and the wall 20 and a plurality of much smaller openings 25 are provided in the flange of the casing member 26 in which the valve seat 16 is formed. The casing member 26 is screw threaded at its lower extremity for connection with a suitable conduit through which fluid is fed to the valve, as indicated at 27, and the head 28 of the casing is similarly threaded for connection to an outlet conduit, such as the heating coil 11. A quantity of a low melting alloy is contained in a reservoir within the wall 20 between the inner surface of this wall and an up-standing wall defining the outer surface of the bearing within which the valve stem 17 operates. This alloy may, for example, be Rose's metal, a composition consisting of 9 parts of bismuth, 1 part of tin and 1 part of lead.

The operation of the valve of the invention, when installed in a heating system for a tank car, is as follows: Assuming that the valve is in closed position, the relationship of the parts when steam is turned into the coil 11 by operation of the manual valve 13 will be that illustrated in Fig. 3. If an ordinary poppet valve were employed for permitting flow of steam to the coil 11, this valve would permit flow of steam under high pressure and in large quantities to the coil immediately upon opening of the valve 13, and

the admission of this steam might well result in breakage of the coil 11 in case that coil were clogged by ice or other foreign matter. The valve of the invention prevents such an accident by permitting the heating fluid to be passed to the coil 11 only through the openings 25 and 24 during the period of time immediately following the opening of the manual valve 13. Since the openings 25 are very restricted, the pressure of the steam is very much diminished in passing through those openings, and the quantity of steam which passes through those openings during this part of the cycle of operations is also restricted. This limited quantity of steam under relatively low pressure will not cause breakage of the coil 11. As the steam passes through the valve in limited quantities, the foreign impurities in the coil 11 are gradually melted or blown through that coil. As the passage of steam through the openings 25 continues, the temperature within the coil 11 increases, and the temperature of the alloy 30 also increases. The heat applied to the alloy 30 in this manner gradually melts that alloy but this melting does not occur until sufficient steam has been passed through the valve to insure melting or removal of the debris in the coil 11. When the alloy 30 has become heated to the point of liquefaction, the pressure on the base of the valve plug 15 will cause this plug to rise from its seat 16 against the pressure of the spring 22 and the force of gravity upon the cap 18, thereby admitting full flow of heating fluid from the valve 13 through the valve 12 to the heating coil. When the supply of heating fluid through the valve 12 and heating coil is thereafter discontinued by closing the manually controlled valve 13, the spring 22 and the force of gravity upon the cap 18 will cause the cap 18 to move into the melted alloy 30 as the valve plug 15 moves back to its seat 16. As the alloy thereafter cools, it will become solid and the bottom portion of the cap 18 will be sealed within the solidified alloy 30. After this has occurred, the cap 18 will be retained in sealed position with the valve plug 15 against the seat 16 until further fluid has been admitted through the openings 25 in a repeated sequence of operations for a sufficient length of time to re-melt the alloy 30. It will thus be seen that the valve affords provision for the admission of a limited quantity of heated fluid under reduced pressure through the openings 25 during the dangerous period when foreign matter may obstruct the coil 11, but that as soon as the danger of breakage of the coil has been obviated by heating the contents of the coil under limited pressure, the full flow of heating fluid through the coil is permitted by lifting of valve plug 15 from its seat 16.

The application of the valve of the invention to a simple heating or cooling coil 32 is illustrated in Fig. 4 of the drawing. In this embodiment, a heating fluid is admitted through a manual valve (not shown) to the valve 12 of the invention and passes from this valve 12 through a conduit 33 to a coil 32 and a conduit 34.

While the invention has been described specifically with reference to the use of the valve of the invention in a heating system, it will be understood that its use is not restricted to such a system since the advantages of the invention may also be attained in the use of such a valve in a cooling system, or in feed of fluid through a conduit which is not designed either as a heating or cooling system. Thus in the case of clogging of any conduit by means of solid impurities, such a conduit may be cleaned out by liquefaction or removal of those impurities by admission of steam or other heated fluid through a valve made in accordance with the invention.

The invention may be modified in a number of particulars. The spring 22 may, for example, be eliminated in cases in which the valve is located in a vertical plane as illustrated and the force of gravity may be relied upon for returning the cap 18 to its seat within the melted alloy 30. Still further modifications will be obvious to those skilled in the art, and I do not therefore wish to be limited except by the scope of the subjoined claims.

I claim:

1. A valve comprising a casing, co-acting valve closure members within said casing, openings within said casing permitting by-pass flow of a limited quantity of heating fluid through said valve casing immediately upon admission of said fluid to the casing, a normally solid low melting alloy within the casing, and means co-acting with said alloy to seal said valve closure members in closed position until said low melting alloy has been liquefied by passage of said heating fluid through said openings.

2. A valve comprising a casing, co-acting valve closure members within said casing, openings within said casing permitting by-pass flow of a limited quantity of heating fluid through said valve casing immediately upon admission of said fluid to the said casing, a normally solid low melting alloy within the casing, means co-acting with said alloy to seal said valve closure members in closed position until said low melting alloy has been liquefied by passage of said heating fluid through said openings, and means to return said valve closure members to closed position upon discontinuance of admission of heating fluid to said casing.

3. A valve comprising a casing, co-acting valve closure members within said casing, openings within said casing permitting by-pass flow of a limited quantity of heating fluid through said valve casing immediately upon admission of said fluid to the said casing, a normally solid low melting alloy within the casing, means co-acting with said alloy to seal said valve closure members in closed position until said low melting alloy has been liquefied by passage of said heating fluid through said openings, and a spring to return said valve closure members to closed position upon discontinuance of admission of heating fluid to said casing.

4. A valve comprising a casing, a co-acting valve plug and valve seat within said casing, openings permitting by-pass flow of a limited quantity of heating fluid through said valve casing immediately upon admission of said fluid to the casing, a normally solid low melting alloy within the casing, and means co-acting with said alloy to seal said valve plug against said valve seat until said low melting alloy has been liquefied by passage of said heating fluid through said openings.

5. A valve comprising a casing, a co-acting valve plug and valve seat within said casing, openings permitting by-pass flow of a limited quantity of heating fluid through said valve casing immediately upon admission of said fluid to the casing, a normally solid low melting alloy within the casing, means co-acting with said alloy to seal said valve plug against said valve seat until said low melting alloy has been lique-

fied by passage of said heating fluid through said openings, and means to return said valve plug into closed position against said valve seat upon discontinuance of admission of heating fluid to said casing.

6. A valve comprising a casing, a co-acting valve plug and valve seat within said casing, a valve stem secured to said valve plug, openings permitting by-pass flow of a limited quantity of heating fluid through said casing immediately upon admission of said fluid to said casing, a normally solid low melting alloy within the casing, and means associated with said valve stem for co-acting with said alloy to seal said valve plug against said valve seat until said low melting alloy has been liquefied by passage of said heating fluid through said openings.

7. A valve comprising a casing, a co-acting valve plug and valve seat within said casing, a valve stem secured to said valve plug, openings permitting by-pass flow of a limited quantity of heating fluid through said valve casing immediately upon admission of said fluid to the casing, a normally solid low melting alloy within the casing, and a member secured to said valve stem in such position as to dip into said alloy when said valve plug is seated against said valve seat and when said alloy is in a liquid state whereby to retain said valve plug against said valve seat after said alloy has solidified and until said alloy has been liquefied by passage of said heating fluid through said openings.

8. A fluid conduit comprising an outer wall, a valve seat associated with said conduit, a reciprocable valve plug coacting with said valve seat to preclude normal flow of fluid through the conduit when the valve plug is in closed position, by-pass openings to permit limited flow of fluid through the conduit when said valve plug is in closed position, a valve stem projecting from said valve, means within said conduit for guiding said valve stem in reciprocating movement to and from closed position, a normally solid low-melting alloy within said casing for retaining said valve plug in closed position when the temperature in the zone of said retaining means is low, but permitting said valve to leave said valve seat and be guided by said guide means to open position to cause normal flow of fluid through the conduit to be resumed when the temperature in the zone of said retaining means has been raised to a predetermined point.

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