UNITED STATES PATENT OFFICE.

MARK C. HONEYWELL, OF WABASH, INDIANA.

EXPANSION DEVICE FOR HOT-WATER HEATING SYSTEMS.

No. 868,862. Specification of Letters Patent. Patented Oct. 22, 1907.

Application filed February 21, 1906. Serial No. 302,288.

To all whom it may concern:

Be it known that I, MARK C. HONEYWELL, a citizen of the United States, residing at Wabash, in the county of Wabash and State of Indiana, have invented a new and useful Expansion Device for Hot-Water Heating Systems, of which the following is a specification.

This invention relates to sealing devices and expansion devices for that class of hot water heating systems in which a pressure is maintained to enable the water to be heated above 212° without generating steam.

It has heretofore been proposed to provide a mercury chamber communicating through the expansion pipe of a heating system with a boiler, a separating bulb or chamber being supported between the mercury chamber and the expansion tank with a pipe depending from the expansion tank into the mercury chamber where a column of mercury is maintained, this column of mercury rising, under pressure from the system, into the depending pipe, where it forms a column of fluctuating height acting in the nature of a weight upon the water in the system, thus making it possible to heat the water above the boiling point without generating steam. In the operation of said device under the variable pressure in the circulating system, the mercury would be at times projected into the separating bulb, permitting water to pass into the expansion tank, the mercury settling back into the mercury chamber upon the cessation of high pressure. It has been found, however, that under some conditions, the water in the system being at a temperature in excess of 212°, and the mercury being projected by a sudden excess of pressure into the separating bulb, generation of steam would instantly begin to take place, and, having once commenced, could not be checked until the temperature was reduced below 212°.

To overcome this objection, and the disadvantages resulting therefrom, is the object of the present invention, which, with these and other ends in view which will readily appear as the nature of the invention is better understood, consists in the improved construction and novel arrangement and combination of parts, which will be hereinafter fully described and particularly pointed out in the claims.

In the accompanying drawings has been illustrated a simple and preferred form of the invention; it being, however, understood that no limitation is necessarily made to the precise structural details therein exhibited, but that changes, alterations and modifications within the scope of the invention may be made, when desired.

In the drawings, Figure 1 is a vertical sectional view of a device constructed in accordance with the principles of the invention. Fig. 2 is a sectional detail view, taken on the plane indicated by the line 2—2 in Fig. 1.

Corresponding parts in the several figures are indicated throughout by similar characters of reference.

The device, in the simple form illustrated in the drawing, includes a vessel or casing 1, constituting a mercury chamber and having near its upper end means, such as an aperture 2, surrounded by an internally threaded flange 3 for connection with the expansion pipe 4 of the hot water heating system in which the device is installed. 5 represents the separating bulb which is disposed beneath the expansion tank 6 with which it is suitably connected, as by means of a short pipe section 7; it being understood that the separating bulb of the device is to be located a sufficient distance below the expansion tank to give to the contents of the latter sufficient head or pressure to enable it to return through or past the mercury contained in the chamber 1 to the circulating pipes of the system when the water in the system contracts, owing to a reduction of temperature; connected with the bottom of the separating bulb is a pipe 8, which I call the stand pipe, depending into the mercury chamber with the top of which the said stand pipe 8 is tightly connected; for instance, by threading it into the neck or top 9 of said mercury chamber, as shown in the drawing. Within the separating bulb, between the pipes 7 and 8, there is supported a deflector 6′.

The stand pipe 8 extends to within a short distance of the bottom of the mercury chamber, and within said stand pipe is disposed a smaller circulating pipe 10 having at its lower end an elbow 11 connected with the surrounding pipe 8 near the lower extremity of the latter. Means may be provided for supporting the pipe 10 within, and spacing it from, the walls of the surrounding pipe 8, but such means are not absolutely essential, and none have been shown. The lower end of one of the tubes must communicate with the interior of chamber 1 at a point above the point of communication of the other of said tubes with said chamber, and a convenient means of securing this arrangement is shown in Fig. 1 where the lower end of pipe 8 has secured to it an enlargement 12, the depending flange of which extends close to the bottom of the chamber 1. The lower end of tube 10 is bent and passed through the depending flange of the enlargement 12 at a point somewhat above its lower edge so that the lower end of the tube 10 will be uncovered by the depressed mercury within the chamber 1 while the lower edge of the depending flange of the enlargement 12 is still immersed in the mercury. Likewise, for convenience in constructing and assembling the parts, the bottom of the mercury chamber is provided with a removable plug 13.

A suitable quantity of mercury is placed in the chamber, the horizontal line 14 indicating the level of the mercury when not subjected to pressure from the system. Adjacent to the line which represents the normal mercury level, there is a drainage plug 15.

In the operation of this device, the ordinary expansion in the system will displace the mercury upwardly into the pipes 8 and 10 where the column thus formed

causes a pressure upon the water in addition to the atmospheric pressure, and that of the water above the mercury, which enables the water to be raised to a temperature exceeding the boiling point without generating steam. During the variable pressure incident to the operation of the system, the mercury level in the chamber or casing 1 will fluctuate and may, at times, on sufficient increase of pressure in the circulation system, be forced below the lower lateral terminal of the pipe 10, when the water will ascend through said pipe, carrying with it more or less of the mercury, which latter, on being projected into the separating bulb from the pipe 10, will quickly return through the pipe 8, the deflector 6′ preventing any possibility of its entering the expansion tank, thus raising the mercury level in the mercury chamber and operating in a manner not unlike a balanced valve to regulate the passage of water through the pipe 10. Relief will thus be afforded from high pressure caused, for instance, by overheating, or by the accumulation of air in the radiators of the system, and such relief will be afforded without removing from the water the weight of the mercury column in the pipe 8, thus preventing the generation of steam.

When, owing to the reduction of temperature, the water in the system contracts, the mercury level in the pipes 8 and 10 will be gradually lowered, the mercury returning from said pipes to the chamber 1 where it resumes its normally sustained level. Still further contraction of the water in the system will cause the water from the expansion tank, which has followed up the mercury through the tubes 8 and 10, to be forced, or returned, by the head or pressure existing in the expansion tank, through or past the mercury and to the circulating pipes of the system.

The circulating tube 10 is made large enough to take care of the water of expansion during the fluctuations of ordinary firing; but should the water be turned into the system from the city service for the purpose of replenishing the system, and the system become filled before the filling valve is closed, this rapid flow of water under city pressure will tend to lift all the mercury from both the circulating tube and the stand pipe into the separating bulb or chamber. The deflector 6′ within said chamber will arrest the mercury, and the full flow of water will pass up to the expansion tank practically unobstructed; but as soon as the inlet valve is closed, the mercury will gravitate back into the mercury chamber, and the device will again be ready for operation.

Generation of steam will be guarded against by the presence of the circulating pipe; but, if it should take place, the action of the mercury will be the same as when water is turned into the system under pressure from the city service.

A positive pressure will be produced by the use of this improved device, the pressure varying with the height of the stand pipe, as will be readily understood.

The improved device, as will be seen from the foregoing description, is simple in construction, and it may be readily installed at a moderate expense. Its operation is entirely automatic, requiring no attention whatever after its first installation, and it has proven to be thoroughly efficient for the purposes for which it is provided.

It will be noticed that the lower end of pipe 10 becomes exposed before any possibility of exposure of the lower end of pipe 8 so that, under all ordinary working conditions, the column of mercury in pipe 8 will continue to act upon the water in the system connected with pipe 4, even though the pipe 10 be acting as a relief passage. As a consequence, under all ordinary working conditions, there is no tendency to blow both columns of mercury up into the separating chamber.

Having thus described the invention, what is claimed is:—

1. A relief device of the class described, comprising a mercury bath with means for admitting fluid pressure to the top of the bath, and a pair of tubes communicating at a point materially above the bath and each having an inlet at its lower end immersed in said bath but at different levels and so arranged that the fluid above the mercury will, upon depression of the mercury bath by such fluid, first enter the tube having the higher inlet, for the purpose set forth.

2. A relief device of the class described, comprising a mercury bath with means for admitting fluid pressure to the top of the bath, a pair of tubes each having an inlet at its lower end immersed in said bath but at different levels and so arranged that, upon depression of the mercury bath by such fluid, the fluid above the mercury will first enter the tube having the higher inlet, and a separating chamber forming a communication between the two tubes at a point materially above the mercury bath and adapted to receive fluid pressure.

3. A relief device of the class described, comprising a mercury bath with means for admitting fluid-pressure to the top of the bath, and a pair of tubes one within the other and having independent inlets at their lower ends immersed in said bath, one of said inlets being at a higher level than the other.

4. A relief device of the class described, comprising a mercury bath with means for admitting fluid-pressure to the top of the bath, and a pair of tubes having independent inlets at their lower ends, one higher than the other, said inlets immersed in said bath.

5. A relief device of the class described, comprising a mercury bath with means for admitting fluid-pressure to the top of the bath, and a pair of tubes having independent inlets at their lower ends one higher than the other, said inlets immersed in said bath, and a separating chamber receiving the upper ends of said tubes and forming a communication therebetween.

6. A relief device of the class described, comprising a mercury bath with means for admitting fluid-pressure to the top of the bath, a pair of tubes one within the other and having independent inlets at their lower ends immersed in said bath and one at a higher level than the other, and a separating chamber receiving the upper ends of said tubes and forming a communication therebetween.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

MARK C. HONEYWELL.

Witnesses:
O. C. TEARIN,
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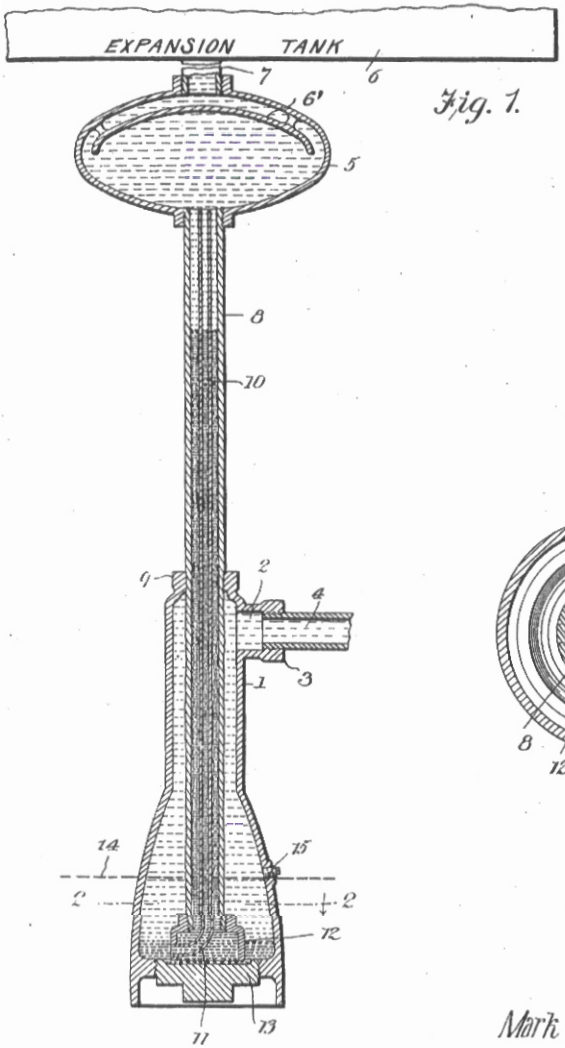
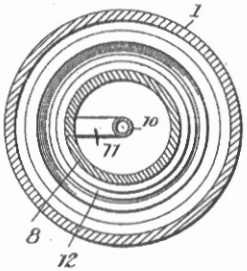


Fig. 1.

Fig. 2.



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