

W. L. BELKNAP & M. G. CUNNINGHAM.
 REGULATOR FOR HOT WATER SYSTEMS.
 APPLICATION FILED JUNE 15, 1910.

1,140,565.

Patented May 25, 1915.
 2 SHEETS—SHEET 1.

Fig. 1

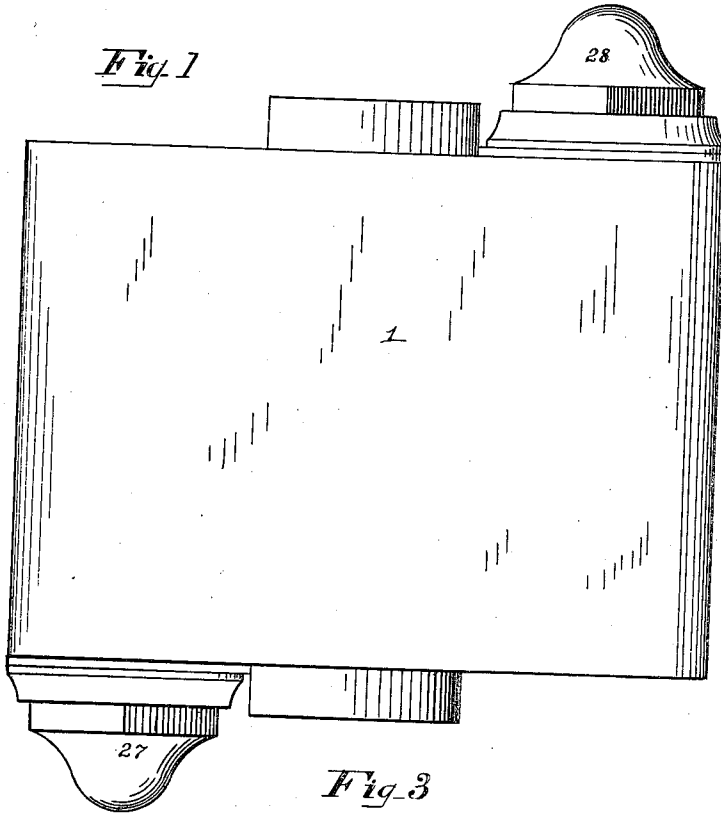


Fig. 3

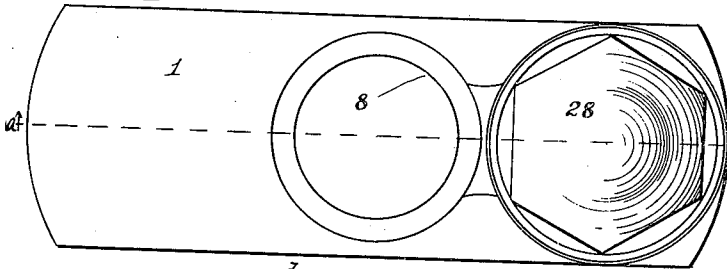


Fig. 7

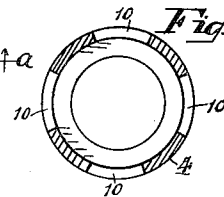


Fig. 4

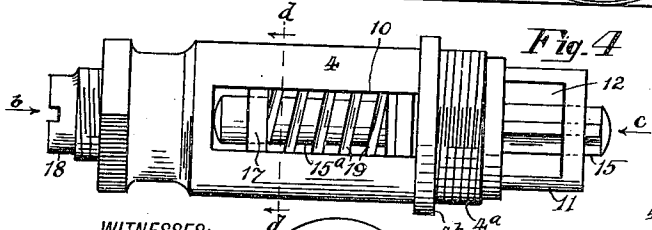


Fig. 6

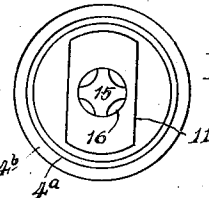
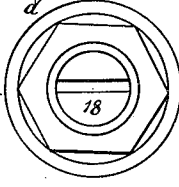


Fig. 5



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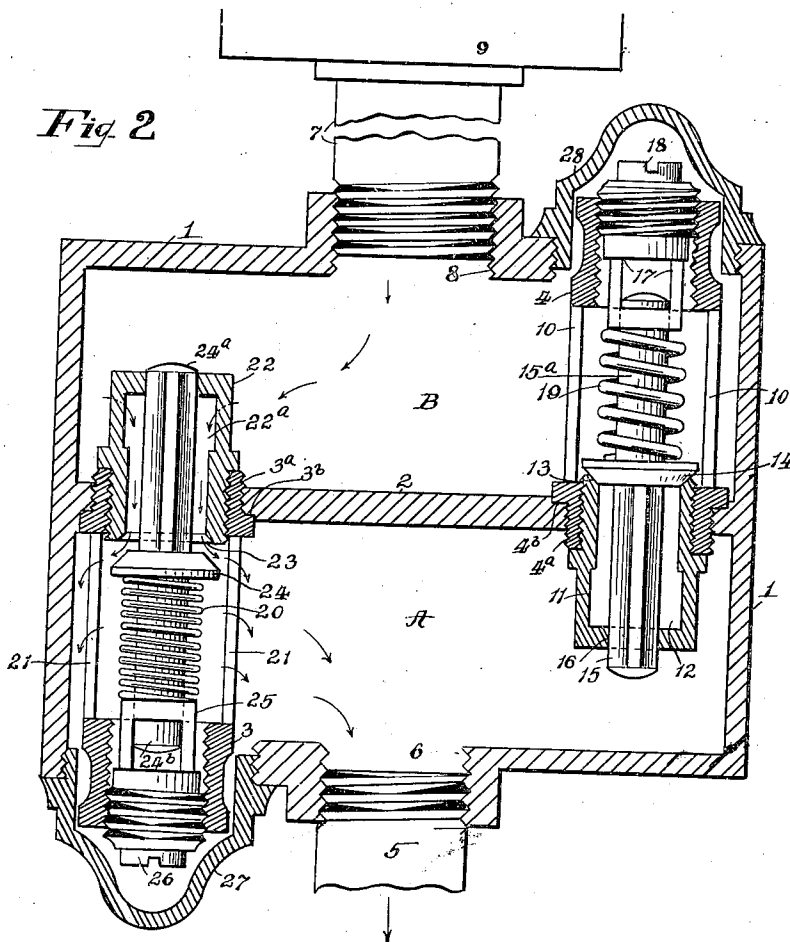
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UNITED STATES PATENT OFFICE

WILLIAM L. BELKNAP AND MICHAEL G. CUNNINGHAM, OF BRIDGEPORT, CONNECTICUT.

REGULATOR FOR HOT-WATER SYSTEMS.

1,140,565.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, WILLIAM L. BELKNAP and MICHAEL G. CUNNINGHAM, citizens of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Regulators for Hot-Water Systems; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to heat and pressure regulators for hot water systems, and it consists in certain details of construction to be more specifically set forth in the following specification.

Referring to the drawings: Figure 1 represents a detached side elevation of the device; Fig. 2 is a central sectional view of the regulator on line *a a* of Fig. 3, broken view of the overflow or expansion tank and pipe connecting the same with the regulator, and broken view of the pipe leading from the regulator to the boiler; Fig. 3 is an upper plan view of the regulator; Fig. 4 is a view of one of the detachable valve cages and valve; Fig. 5 is an end view of the valve cage looking in the direction of arrow *b* of Fig. 4; Fig. 6 is an end view of the valve cage looking in the direction of arrow *c* of Fig. 4; Fig. 7 is a cross sectional view of the valve cage on line *d d* of Fig. 4; Fig. 8 is a detail view of one of the spring controlling plugs; and Fig. 9 is a detail view of one of the valve spindle guides.

The body or casing 1 of the reservoir is interiorly divided by the partition 2 into the two compartments A B, and removably located in this partition are the valve cages 3 and 4, presently to be described.

5 is a pipe screwed into the threaded opening or port 6 in the bottom of the casing which communicates with a boiler or other source of heat or hot water (not shown), and 7 is a pipe screwed into the threaded opening or port 8 in the upper wall of the casing which communicates with the overflow tank 9.

The safety or outlet valve cage 4 (see also Fig. 4) comprises a shell having the threaded end 4^a adapted to be screwed into a threaded hole in the partition 2 and firmly seated against the shoulder 4^b. Elongated openings 10 are formed in the shell for the

discharge of hot water into the chamber B, presently to be described.

11 is a hollow plug removably screwed into the lower end of the shell of the cage and is provided with openings 12 (Fig. 4) for the admission of hot water from the lower chamber A, and the valve seat or outlet port 13 is provided at the top of this plug for the safety or outlet valve 14, which valve has the lower fluted stem 15 (see also Fig. 6) guided in the hole 16 in the end of this hollow plug. The upper valve stem 15^a is movably located in the guide 17 (see also Fig. 9), and 18 is a screw plug located in the upper threaded end of the cage 4, and between the lower end of the guide 17 and the valve 14 is the high pressure spring 19, the tension of which is regulated by the plug 18 contacting with the upper surface of the guide.

The object of separating the screw plug and guide is that the guide can move laterally and thus centralize itself with respect to the valve seat regardless as to whether the said seat was in axial alinement with the plug or not, so that the valve will always reseat itself without any tendency to cramp.

With the exception of the difference in the size and strength of the springs 19 and 20, the construction and detail parts of the opposed cage 3, located in the chamber A, are exactly alike, but to avoid confusion will be designated by different figures of reference as follows: The threaded end 3^a of the cage 3 is removably screwed into a threaded hole in the partition 2 and firmly against the shoulder 3^b, and 21 are openings in the cage for the passage of the return water.

22 is a hollow plug similar to the plug 11 and having openings 22^a therein, and 23 the valve seat or return port in its lower end for the return valve 24 whose upper fluted stem 24^a is guided in said plug, and its lower stem 24^b is in the guide 25 adjusted vertically by means of the threaded plug 26.

The safety valve spring 19 is adjusted to withstand a certain predetermined boiler pressure before the valve will be lifted from its seat. Let it be supposed that the spring 19 is set at ten pounds; when, therefore, the boiler pressure exceeds ten pounds, the valve will lift and the hot water will flow through the openings 10 in the cage 4 into the chamber B and from thence into the overflow or

expansion tank 9. The tension of the light spring 20, under valve 24, is just sufficient to support the weight of said valve and hold it normally against its seat, so that, 5 when the pressure in the chamber A has fallen below that in the chamber B, the cooler water above the valve will open said valve and flow (see arrows, Fig. 2) through openings 22^a, port 23, openings 21 and into 10 chamber A, and from thence through pipe 5 back to the boiler, and when the pressure in the chamber A is substantially equal to the pressure in chamber B the valve 24 will be closed by the spring 20, thus establishing 15 the desired pressure equilibrium.

The removal feature of the valve cages not only lessens the initial cost of construction, but is of great advantage in making repairs, in which case all that is necessary 20 is simply to remove the overlying caps 27 and 28 and remove the cages and make such necessary repairs as are required.

The rectangular construction of the regulator, divided as it is by a partition into 25 two chambers of practically the same area, each capable of holding a comparatively large body of water, is readily susceptible to the slightest change of heat or pressure. The reverse position of the valves will cause 30 the pressure that opens one of the valves to hold the other more firmly to its seat, and thus effectually prevent any possibility of the closed valve lifting.

Having thus described our invention, what we claim is:—

In a regulator of the class described, the combination with a casing having a partition extending across the middle thereof and dividing its interior into a pair of chambers of substantially the same volume, 40 the walls of said casing at opposite sides of said partition having ports adapted for the fitting of the casing to a circulatory system, said partition also having ports to establish communication between said chambers, 45 the walls of the casing at opposite sides of said partition each having an opening in alinement respectively with the ports of said partition, of caps for closing said openings, and a valve structure removably mounted 50 in each port of the partition and displaceable through the opening in the casing which is opposite said port, said valve structures projecting in opposite directions from the partition, and each permitting a 55 flow in one direction, the flows being in opposite directions and said valve structures being responsive to different pressures.

In testimony whereof we affix our signatures in presence of two witnesses.

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MICHAEL G. CUNNINGHAM.

Witnesses:

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