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WATER HEATING SYSTEM AND REGULATOR THEREFOR.

APPLICATION FILED APR. 8, 1908.

932,615. Patented Aug. 31, 1909.

Fig. 1.

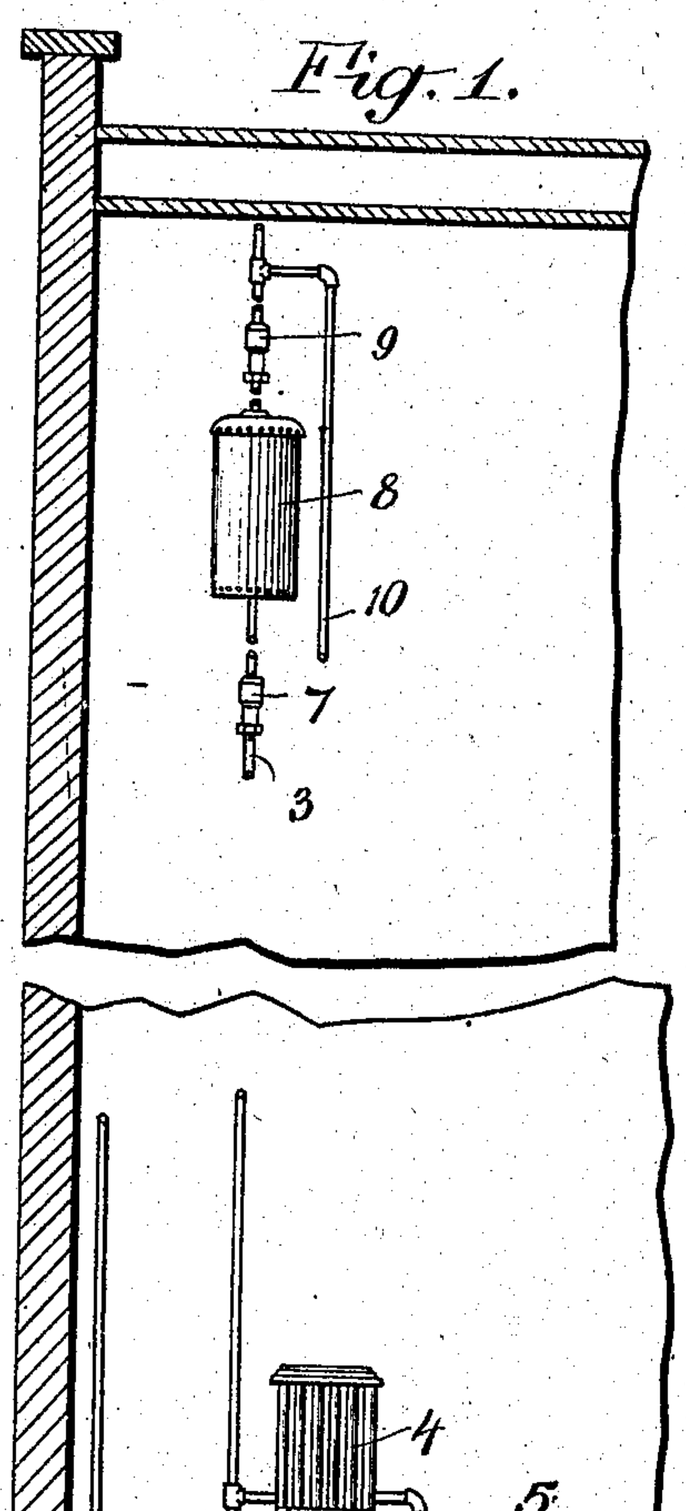


Fig. 2.

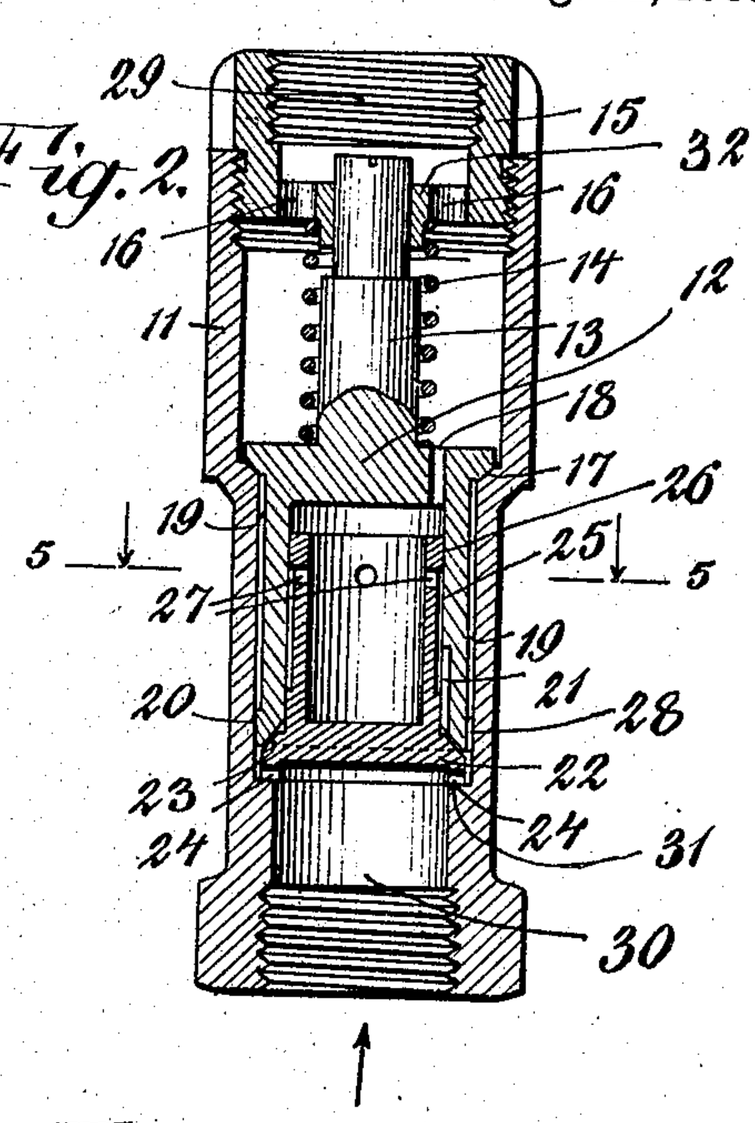


Fig. 3.

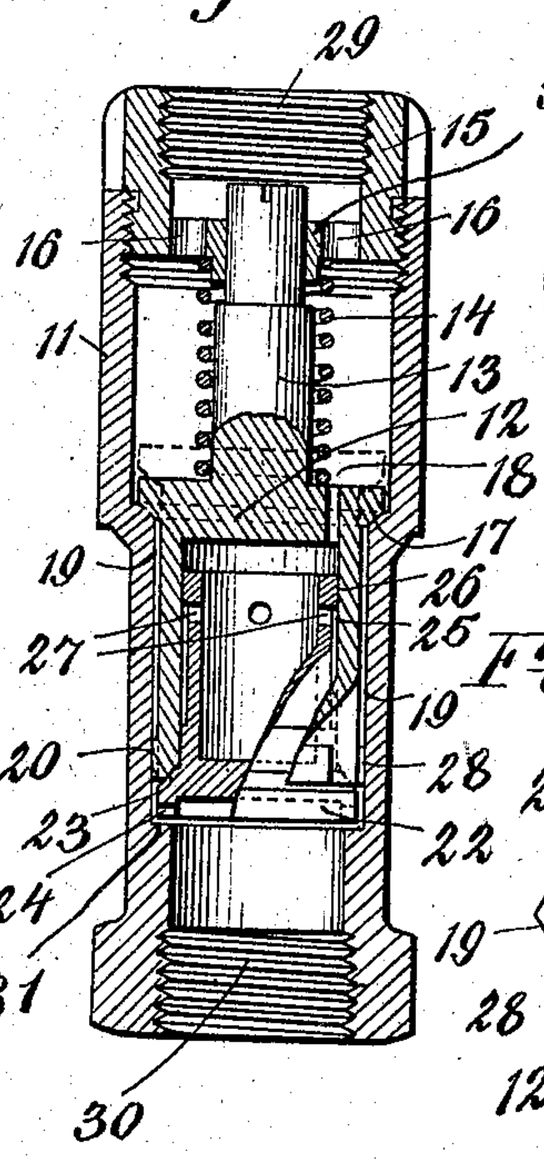


Fig. 4.

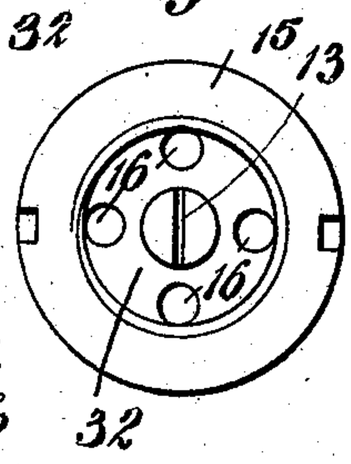
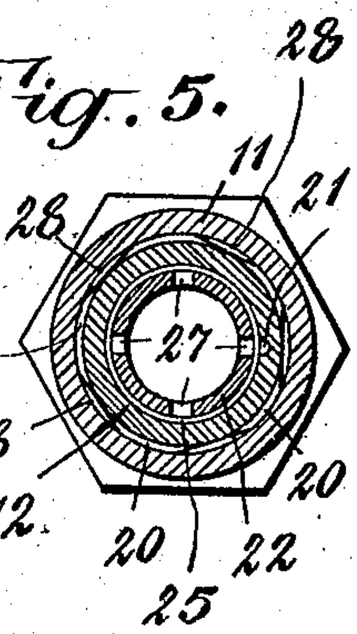


Fig. 5.



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WATER-HEATING SYSTEM AND REGULATOR THEREFOR.

932,615. Specification of Letters Patent. Patented Aug. 31, 1909.

Application filed April 8, 1908. Serial No. 425,806.

To all whom it may concern:

Be it known that I, CURTIS E. KNICKERBOCKER, a citizen of the United States, and resident of Middletown, in the county of Orange and State of New York, have made a certain new and useful Invention Relating to Water-Heating Systems and Regulators Therefor, of which the following is a specification, taken in connection with the accompanying drawings, which form a part of the same.

This invention relates to water-heating systems and regulators therefor and relates especially to water-heating systems which may be operated as open systems and which by the automatic action of the regulators employed are transformed into closed systems for the development of greater radiation.

In the accompanying drawings showing an illustrative embodiment of this invention in a somewhat diagrammatic manner, and in which the same reference numeral refers to similar parts in the several figures, Figure 1 is a vertical section showing the heating system. Fig. 2 is a vertical section of the regulator with the parts in their normal position. Fig. 3 is a similar view with the control valve closed as when the system is operating as a closed system. Fig. 4 is a top view thereof; and Fig. 5 is a horizontal sectional view along the line 5—5 of Fig. 2.

In the illustrative embodiment of this invention shown in the drawings, the water-heating furnace 1 may be connected by the feed pipe 3 with suitable radiators, such as 4, on the several floors 5 of the building 6 which may also be provided with separate return connections leading to the return pipe 2 to carry the water back to the furnace. The feed pipe may be connected with a suitable expansion tank 8, as is usual, the over-flow pipe 10 connecting, if desired, with the upper end of the expansion tank so as to connect with an over-flow tank or sewer discharge, as well as having, if desired, a branch extending up to the top of the building to furnish additional atmospheric connection. The regulator 7 may be used in the feed pipe adjacent the expansion tank or if desired the regulator 9 may be used in the over-flow pipe connection adjacent the top of the expansion tank. In some cases, however, one of these automatic regulators may be installed both above and below the expansion tank where special reliability is desirable.

The regulator automatically converts the open system into a closed system as the furnace is fired more vigorously, the regulator preferably having a compensating discharge passage governed by a suitable control valve which is normally held in open position with the proper yielding action, so that under normal conditions the system is open and the feed pipe has communication with the atmosphere through the constricted compensating passage. When, however, the system is more vigorously operated to develop greater radiation, the temperature of the circulating medium increases and the fluid expands and tends to flow through the constricted compensating passage with sufficient velocity to force the control valve against its seat and thus close the compensating passage, transforming the system into a closed system. The system may operate in this manner with the heating fluid at such high temperature that the radiation can be very materially increased above the radiation obtainable from the heating fluid in the open system, it being usually desirable to have a suitable safety or relief valve to limit the temperature and resulting pressure of the heating medium to a safe amount.

The regulator may comprise a suitable casing 11 provided with a threaded lower flange 30 and within which the relief valve 12 may be mounted, so as to coöperate with a suitably inclined seat 17 of conical or other desired form, the relief valve having, if desired, a suitable body provided at its lower end with the annular guide 20 through which suitable relief ports 28 may be formed to communicate with the annular relief passage 19. If desired, the valve may be more accurately guided by a stem 13 formed on the valve and having a reduced upper end passing through a suitable guide 32 in the cap or upper flange 15 provided with the threaded portion 29 secured in the upper end of the casing. The relief valve is of course normally pressed against its seat by a spring 14 having the desired strength, the spring being so proportioned as to allow the relief valve to lift when the heating fluid has reached the desired maximum pressure in the heating system on which the valve may rise into the dotted position indicated in Fig. 3, allowing the heating fluid to escape through

the discharge holes 16 and discharge or overflow pipe to the desired extent so as to prevent the development of any excessive pressure in the system.

The compensating passage and control valve may, if desired, be formed in connection with the relief valve, although, of course, this is not necessary in all cases. In the illustrative form of the invention as shown in Fig. 2 of the drawing, the control valve 22 may coöperate with a suitable seat 23 formed in the lower end of the relief valve, the control valve being guided if desired by having a suitable body extending within a cylindrical cavity in the relief valve and being provided at its upper end with a suitable guide flange 26 to accurately guide the control valve in its movements, the open position of the control valve being determined by proper means, such as a suitable shoulder 31 in the casing with which the valve coöperates as indicated. In this position a constricted compensating discharge passage is formed around the valve by the channels 24, the constricted compensating port 21, the annular passage 25 and the radial apertures 27 so that the fluid may ultimately escape through the aperture 18 in the relief valve. This passage is of course sufficient to allow such gradual movements of the heating liquid as occur during the normal operation of an open system, the control valve being normally held in open position with the desired force by any suitable means such as by the weight of the valve which may, of course, be adjusted so as to exert the desired opening force. The expansion and consequent pressure developed on the control valve when the circulating fluid is heated to temperatures approximating the boiling point serve to close the control valve and hold it tightly upon its seat so that the system continues to operate as a closed system as long as the furnace is energetically fired. When the need of special radiation ceases and the system is operated more moderately, the temperature and volume of the heating fluid decrease, the control valve automatically returning to normal position as shown in Fig. 2, and the system thereupon operating as an open system.

Having described this invention in connection with illustrative embodiments thereof, to the details of which disclosure the invention is not, of course, to be limited, what is claimed as new and what is desired to be secured by Letters Patent is set forth in the appended claims.

1. The water-heating system comprising a furnace, radiators, feed and return pipes connected with said furnace and with said radiators, an expansion tank in communication with said feed pipe and the atmosphere and a regulator between said feed pipe and said expansion tank and a regulator beyond said expansion tank controlling the atmospheric communication with said tank, said regulators comprising a casing having an inclined seat, a relief valve having a conical portion coöperating with said seat and having a guide and stem coöperating with said casing to guide said relief valve, a spring normally holding said relief valve in closed position and permitting its opening on the development of excessive pressure in said system, a control valve having a conical portion coöperating with an inclined seat formed on the lower portion of said relief valve, said control valve having a body located within a cavity in said relief valve and guide flange coöperating with said cavity to guide said control valve in its movements, a shoulder formed in said casing to determine the open position of said control valve, said control valve having sufficient weight to normally hold the same in open position and provide a constricted compensating passage through said regulator to permit the system to normally operate as an open system, said control valve being automatically closed on the energetic operation of said system to convert said system into a closed system for operation at increased temperature and pressure of the heating medium.

2. The water heating system comprising a furnace, radiating means, feed and return pipes connected with said furnace and with said radiating means, an expansion tank in communication with said feed pipe and the atmosphere and a regulator beyond said expansion tank controlling the atmospheric communication with said tank, said regulator comprising a casing having a seat, a relief valve coöperating with said seat, a spring normally holding said valve in closed position and a control valve normally in open position to provide a constricted compensating passage through said regulator to permit the system to normally operate as an open system, said control valve being automatically closed on the energetic operation of said system to convert said system into a closed system for operation at increased temperature and pressure of the heating medium.

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