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HOT WATER HEATING APPARATUS.
APPLICATION FILED JAN. 29, 1915.

1,148,857.

Patented Aug. 3, 1915.
2 SHEETS—SHEET 1.

Fig. 1.
To all whom it may concern:

Be it known that I, ANDERS BORCH RECK, captain, a subject of the Kingdom of Denmark, residing at Hellerup, in the Kingdom of Denmark, have invented new and useful Improvements in Hot-Water Heating Apparatus, of which the following is a specification.

During the last fourteen years there has come into general use a kind of hot water heating apparatus where the operating agent of the motion of the water is steam that is generated in the boiler or other part of the apparatus, that is heated by the action of fire, steam or water. In apparatus according to Fig. 2, the heater 1 is a closed chamber through which the water of the heating apparatus passes, steam from a steam pipe 22 being introduced into the chamber, the water being heated in the apparatus.

When by such forms of apparatus as hitherto have been used only a slow fire is burning in the boiler that is connected with the apparatus, for instance in mild weather or during the night, then it will generally be found that the suction effect in the main rising pipe will only be produced at rather long intervals, the result being that there will be great variations in the velocity of the water through the pipes and radiators of the apparatus. Now—when such variations occur it may happen that the operation of the apparatus is not completely noiseless and moreover it may happen, that too small a quantity of water will pass through such branch pipes as may not be so favorably situated as other branch pipes in the manner in which they are connected to the mains. Such cases as these described are always the more apt to occur the higher the main rising pipe of the apparatus is. But since the suction in the rising pipe is wholly dependent on its height, it is highly desirable, that the said height always can be chosen as great as the local circumstances will allow.

The object of the present invention is therefore to make it possible to make the height of the main rising pipe as great as possible by providing means for maintaining a continuous suction in the main rising pipes of apparatus of the class described even in cases where the height of the pipe is great.

The accompanying drawings show diagrammatically in Figures 1 and 2, two heating installations as examples of how the invention can be applied to heating apparatus.

The following description may be read on both figures except where each figure is mentioned separately.

1 indicates a heater, wherein the circulating water is heated up to such a degree that it will boil in the main rising pipe 7. The steam produced by this boiling reduces the specific gravity of the column of fluid in the pipe 7 to such a degree that a powerful suction is produced and the effect of this suction is the circulation of the water through the whole apparatus.

In apparatus according to Fig. 1 the heater 1 consists of a hot water boiler where in the water is heated by contact with the heating surfaces of the boiler, these surfaces being heated by the action of fire, steam or water. In apparatus according to Fig. 2 the heater 1 is a closed chamber through which the water of the heating apparatus passes, steam from a steam pipe 22 being introduced into the chamber, the water being condensed in it.

The upper end of the pipe 7 is shown connected to a tank 8, wherein the steam that has been developed in the pipe 7 is separated from the water, the steam passing through pipe 10 to the condenser 4, while the water passes through pipe 9 to 2, which indicates that part of the heating apparatus, wherein the water is cooled down by passing through heat absorbing parts such as radiators, pipe coils and the like.

In apparatus designed as shown in the two diagrams the tank 8 not only acts as a separator but also as an expansion tank.

The pipe 3 is the main return pipe that leads the cooled water from 2 to the condenser 4, which is shown placed on about the same level as the separating and expansion tank or steam chamber 8. The condenser is shown in both diagrams as a surface condenser, built of pipes expanded into the walls of two end chambers. The steam that has been separated from the water in tank 8 will be condensed on the outer surface of the pipes of the condenser and the water produced by the condensation will pass through pipe 11 and its way back to the water that circulates in the heating apparatus. When the water from the return pipe 3 has passed the condenser 4 it completes its circuit by passing through the automatic regulating valve 5 and pipe 6 to 110 heater 1.

Apparatus of the kind shown in Fig. 2 are composed of two distinct parts, a steam part consisting of the boiler 21 and the
steam pipe 22 and a hot water part consisting of the rest of the apparatus. Since steam is constantly passing from the steam part to the hot water part, the steam being condensed in the water on its passage through the heater 1, the expansion tank 3 of the hot water part must be provided with an overflow pipe 23. Moreover means must be provided to keep the water line in the steam boiler 21 unaltered. In Fig. 2 this purpose is fulfilled by simply connecting the lower end of the overflow pipe 23 to the water part of the boiler 21.

In both figures 12 and 13 there are indicated automatic air valves of that known kind which allow all air to pass to the outside but keep back both water and steam. It will be seen that 13 is placed on the steam chamber of the condenser, while 12 is placed on one of the water chambers. The application of the two air valves will prevent air from impairing the condensation of the steam and the circulation of the water through the apparatus.

The application of the invention to heating apparatus of the kind described is made possible by such means as those indicated below. 15 is the lever of one of the known membrane regulators. The lever turns on a fulcrum 14. It carries a weight 16, whose pressure is transferred by the rod 17 to the upper side of the membrane 18. The pressure in the steam space of the separator 8 is transmitted through the pipe 19 to the underside of the membrane 18. A rod 20 connects the lever 15 with the disk of the automatic regulating valve 5, which is shown inserted where the pipe 6 is connected to the condenser 4.

It will now easily be seen how the process of regulation which is the main feature of the present invention can be realized by means of the combined action of the membrane 18 and the valve 5. In proportion to the pressure of the steam in the tank 8 augmenting above or diminishing below the pressure on the membrane 18, the disk of the valve 5 will be lifted or lowered and the quantity of water passing through the valve will be augmented or diminished in the same proportion.

The effect produced by the process of regulation described will best be seen if the case is supposed, where it happens that either the supply of heat to the heater 1 or the temperature of the water that flows to the heater through the pipe 6 is diminished. The effect will in either case be that in addition to the diminution of the formation of steam in the pipe 7 the pressure of the steam in the separator 8 will be diminished also. But if the pressure of the steam in the separator 8 drops, then by the described action of the membrane 18 and the valve 5 the quantity of water flowing to the heater 1 will be diminished at once to such an extent that the supply of heat to the heater 1 will again be sufficient to prevent the formation of steam in the pipe 7 from being low. Consequently such actions will prevent the suction in the pipe 7 from being interrupted but moreover it will also prevent the suction in the pipe 7 from drawing air through the air valve 12 into the water space of the condenser. Such penetration of air would of course impair the circulation of the water in the apparatus, and in all cases where it is advantageous to place the condenser on a high level such penetration would be the effect of the suction in pipe 7 if nothing prevents the steam pressure in the separator 8 from being too low.

One of the most important advantages of having the condenser at a high level is that the higher the condenser is placed the more will its action be independent of the level at which the boiler or heater of the apparatus stands.

It has already been said that the diagrams and the description above are only to be taken as examples of how it is possible to apply the invention to hot water heating apparatus.

The manner in which the invention may be applied may be modified and supplemented in different ways.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

In a hot water heating apparatus, a water circuit, including a riser pipe and a return pipe, a steam generator in communication with the lower portion of the riser pipe, a steam chamber in communication with the upper end of the riser pipe, a valve in the return pipe and a pressure-operated motor in communication with the steam chamber for opening and closing said valve, respectively, as the steam pressure rises above or falls below certain predetermined limits.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses:

ANDERS BORCH RECK.

Witnesses:

V. BELSCHNER,
TENGELEARD A. MADSEN.