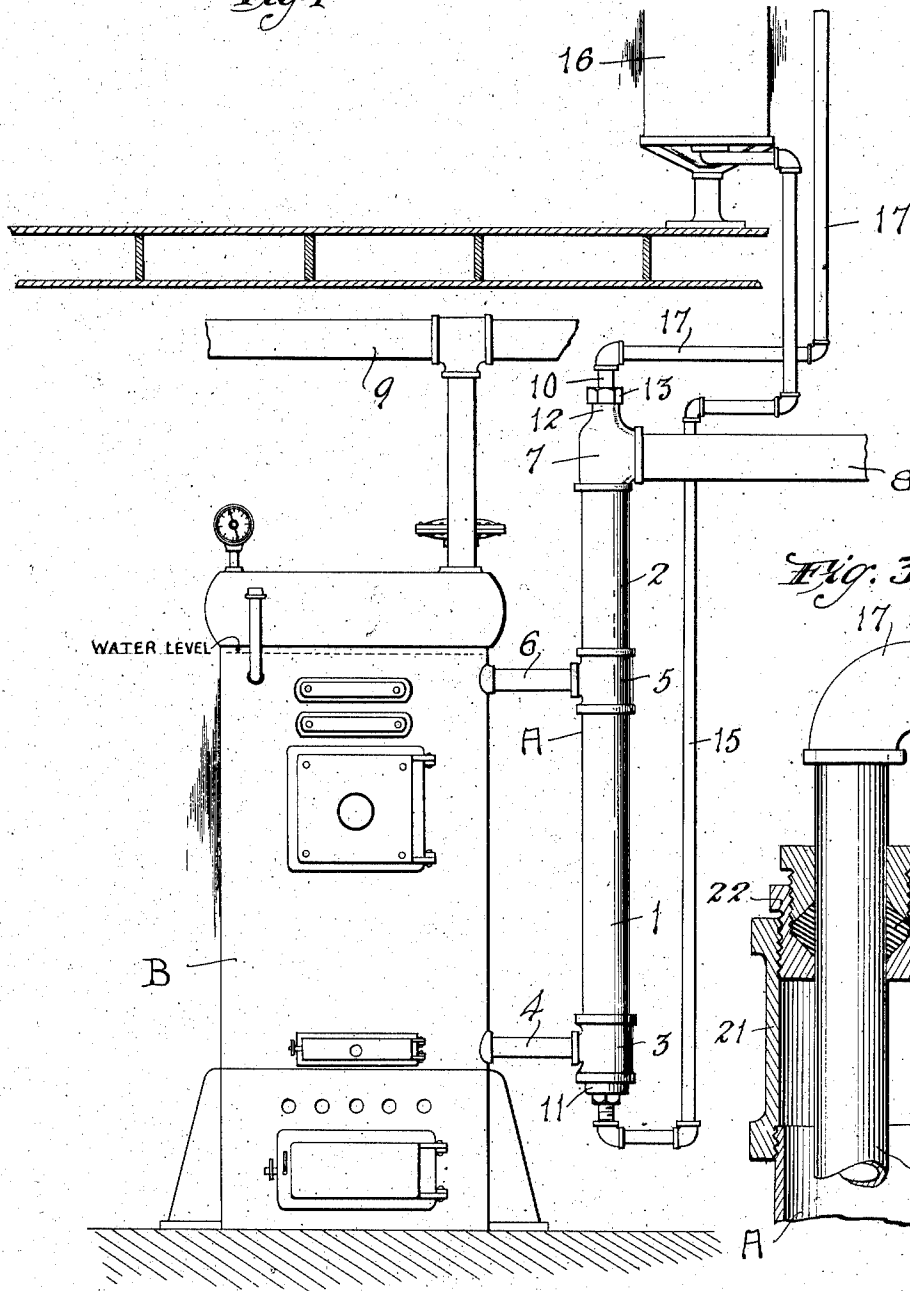
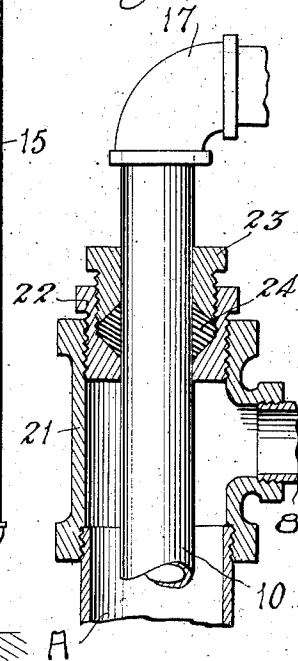


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2 SHEETS—SHEET 1.

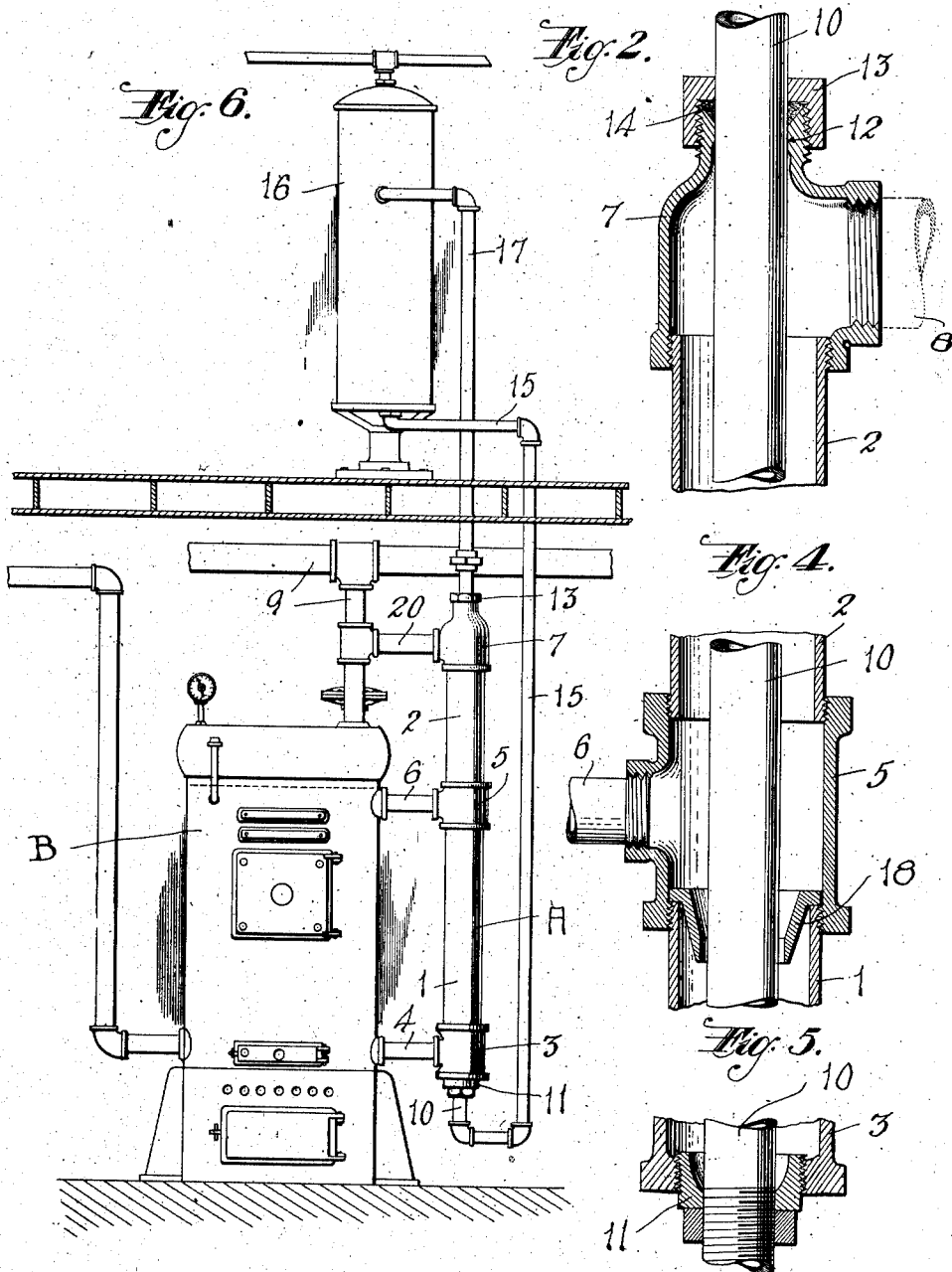


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1,401,523.

Patented Dec. 27, 1921.

2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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HEAT-EXCHANGE SYSTEM.

1,401,523.

Specification of Letters Patent.

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Application filed April 29, 1921. Serial No. 465,388.

To all whom it may concern:

Be it known that I, WILLIAM COATES, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Heat-Exchange Systems, of which the following is a specification.

This invention relates to a heat exchange system for utilizing the hot water and steam of a steam or hot water heating system for heating the water of a hot water service system, such for instance as the hot water tank in the kitchen of a dwelling.

The objects of the invention are to provide a system of the character described whereby hot service water can be obtained at all times even during the night and early morning when the boiler fires are banked and the steam is low or the water is below ordinary operating temperature; to provide improved means for utilizing the return fluid from a heating system for heating service water; to thus provide a stand pipe or chamber connected at one end to the water chamber of the boiler of a heating system adjacent the bottom thereof and connected at an intermediate point in its length to said water chamber immediately below the water level therein, the other end of said stand-pipe being connected to the return pipe of the heating system whereby the water in said boiler circulates through said stand-pipe and the return fluid also passes thereinto, a conduit connected to the service water tank having a portion thereof arranged within said stand-pipe; to provide such a system in which the circulation of the boiler water in the stand-pipe produces a partial vacuum in the return pipe to facilitate the circulation of steam through the heating system; to provide an improved construction for allowing free expansion and contraction of the portion of the service water pipe line within said stand-pipe due to changes in the temperature of the water, and to obtain other results and advantages as may be brought out by the following description.

Referring to the accompanying drawings, in which like numerals of reference indicate the same parts throughout the several views,

Figure 1 is a side elevation of a heat exchange system constructed in accordance with my invention, portions of the hot water tank being broken away;

Fig. 2 is an enlarged transverse vertical

sectional view through the connection of the upper end of the stand-pipe to the steam return pipe and showing the slip joint of the service water pipe with the stand-pipe;

Fig. 3 is a similar view of the connection showing a modified construction;

Fig. 4 is a vertical sectional view through the connection of the stand-pipe to the upper end of the water chamber of the steam boiler;

Fig. 5 is a similar view of the connection of the stand-pipe to the lower end of the water chamber and the connection of the service water pipe to the stand-pipe, and

Fig. 6 is a side elevation of a modified connection of my heat exchange system to the boiler of a steam heating system.

In the embodiment of my invention shown in Figs. 1-4 inclusive of the drawings, the reference character A designates a stand-pipe which is preferably formed of two sections 1 and 2 which are adapted to be arranged in a vertical position at one side of the boiler B of a heating system. One end of one of the sections of the stand-pipe, in the present instance the section 1, is connected by a T-connection 3 and a branch pipe 4 to the water chamber of the boiler B adjacent the lower end thereof, the upper end of said section of the stand-pipe, being connected by a similar T 5 and branch pipe 6 to the upper end of the water chamber immediately below the level of the water therein. One end of the section 2 of the stand-pipe is connected to the T 5 opposite the section 1 and the opposite end of said section 2 is connected to a T 7 the lateral arm of which is connected to the return pipe 8 of the heating system which includes the boiler B and the live steam pipe 9.

A pipe 10 of relatively high conductivity, such as a brass pipe, and having a diameter substantially less than that of the stand-pipe A, is arranged axially of the stand-pipe, the lower end of said pipe 10 projecting outwardly below the T 3 and being connected thereto by a reducing plug 11 which has a threaded connection with both the pipe 10 and the T, as clearly shown in Fig. 4 of the drawings. The other end of the pipe 10 passes through a slip joint 12 which may be conveniently formed as a part of the T 7 one arm of which may be reduced as shown on Fig. 2 of the drawings and provided with a cap or gland 13 between which and the T is arranged suitable packing 14.

Another form of slip joint for the pipe 10 in the stand-pipe and connection of the stand-pipe to the return steam pipe 8 is shown in Fig. 3, this construction being preferable in many cases. A three way T-connection 21 having alined branches of a size to fit the stand-pipe A one of which is connected to the stand-pipe, is utilized instead of the special T 7. The slip joint is formed by a bushing 22 screwed into the branch of the T opposite the stand-pipe, which bushing has a reducing bushing 23 screwed therein forming between itself and said bushing 22 a gland 24 through which passes the upper end of the pipe 10. The lower end of the pipe 10 is connected in any suitable manner to one end of a pipe 15, the other end of which is connected to the bottom of the hot water tank 16. The upper end of the pipe 10 is connected to one end of a pipe 17, the other end of which is connected to the hot water tank 16 at an intermediate point in its length, as shown in Fig. 6. The service water is supplied to the tank 16 in the usual way, and it will be observed that the said water will flow through the pipes 15, 10 and 17.

In the operation of the system shown in Fig. 1 of the drawings, the hot water in the upper end of the water chamber of the boiler B will circulate through the branch pipe 6 and T 5 into the lower section 1 of the stand-pipe A and will transfer its heat to the comparatively cool water in the pipe 10 which flows from the tank 16. As the water in the stand-pipe cools it will flow downwardly through the T 3 and branch pipe 4 into the lower end of the water chamber of the boiler, the water in the boiler thus being in continuous circulation through the boiler and the lower section 1 of the stand-pipe. The heat from the return fluid in the return pipe 8 will also be transferred to the pipe 10 at the upper section 2 of the stand-pipe A, and it will thus be seen that I utilize the heat of the return fluid for heating the service water in the tank 16 and at the same time prevent said return fluid from passing into the live steam pipes, or vice versa. As return fluid strikes the comparatively cool pipe 10 it will be immediately condensed and flow downwardly through the section 2 of the stand-pipe, the said condensation producing a partial vacuum in the return pipe 8 to facilitate the circulation of steam through the heating system. To further increase the production of partial vacuum in the steam heating system I may provide an inverted frusto-conical tube 18 at the upper end of the section 1 of the stand-pipe, as shown in Fig. 4 of the drawings, the circulation of water downwardly through the venturi producing a partial vacuum in the section 2 of the stand-pipe. The hot water entering

the stand-pipe through branch pipe 6 is quickly cooled by contact with the pipe 10 and rapidly falls downwardly through the tube 18 which further increases the velocity of said water.

A modified connection of my system to a steam heating system is shown in Fig. 6 of the drawings in which the lateral arm of the T 7 is directly connected by a branch 20 to the live steam pipe 9 instead of to the return pipe. With this construction the upper end of the pipe 10 within the section 2 of the stand-pipe will be heated by live steam instead of by the return steam, and the operation of the system is otherwise identical with that described in connection with Figs. 1-4 inclusive. In both forms of the invention the construction of the stand-pipe and the arrangement of the pipe 10 therein is identical.

The slip joints 12 or 24 are necessary to allow expansion and contraction of the brass pipe 10 due to the sudden changes in temperature therein incident, for instance, to the drawing of hot water from the tank 16 and the sudden flow of cool water into the pipe 10, or the gradual expansion of the pipe 10 due to the heating thereof after contraction by the flow of cool water thereinto. It will be noted that the pipe 10 is in one piece and forms a continuous and unbroken conduit through the stand-pipe A, thereby eliminating any connections within the stand-pipe through which the water in pipe 10 might leak into the stand-pipe, or vice versa, as would be the case were the pipe 10 formed in sections connected within the stand-pipe. My system enables the recovery of the heat in the return steam and hot water which is usually wasted or lost, this heat being utilized to heat service water in the tank 16 which in turn assists in heating the room in which the tank 16 is located.

While I have shown and described two possible embodiments of my invention, it will be understood that this is for the purpose of illustrating the principles thereof only, and that many modifications and changes can be made in the detail construction of my invention without departing from the spirit or scope thereof. Therefore, I do not desire to be understood as limiting myself except as required by the following claims when construed in the light of the prior art.

Having thus described the invention, what I claim is:

1. The combination with a water tank and a steam heating system including a boiler and a steam pipe, of a stand-pipe arranged exteriorly of said boiler and connected to the water chamber of said boiler at points adjacent the bottom thereof and immediately below the water level therein, said stand-pipe being also connected to said

steam pipe above the said water level, and a conduit connected to said water tank and having a portion thereof passing through said stand-pipe.

5 2. The combination with a water tank and a heating system having a boiler and a return pipe, of a stand-pipe arranged vertically at one side of said boiler and formed in two sections connected in alinement by a
10 T-connection, the lower end of the lower one of said sections being connected to the water chamber of said boiler adjacent its bottom, and one arm of said T-connection being connected to said water chamber immediately
15 below the water level therein, the upper end of the upper section of said stand-pipe being in communication with the return pipe, whereby the water in said chamber and the fluid from said return pipe circulate through
20 said stand-pipe, and a conduit connected with said water tank having a portion thereof passing through said stand-pipe from end to end thereof.

25 3. The combination with a water tank containing water to be heated and a steam heating system having a boiler and a return pipe, of a stand-pipe connected to the water chamber of said boiler at points adjacent the bottom thereof and immediately below the

water line thereof, said stand-pipe being also 30 connected above the water level therein to said return pipe, a conduit connected with said water tank passing through said stand-pipe and contacting with the water in said stand-pipe and the fluid in the return pipe, 35 and an inverted frusto-conical tube arranged in said stand-pipe immediately below the water level therein so that circulation of water downwardly in said stand-pipe causes a partial vacuum in the stand-pipe above the 40 water level to increase circulation of steam in the steam heating system.

4. The combination with a steam heating system having a boiler and a return pipe, of a stand-pipe connected to the water chamber 45 of said boiler at points adjacent the bottom thereof and immediately below the water line thereof, said stand-pipe being also connected above the water level therein to said return pipe, and an inverted frusto-conical 50 tube arranged in said stand-pipe immediately below the water level therein so that circulation of water downwardly in said stand-pipe causes a partial vacuum in the stand-pipe above the water level to increase 55 circulation of steam in the steam heating system.

WILLIAM COATES.