May 19, 1925. 1,538,436

A. H. KOHLMEYER

WATER HEATER AND STEAM GENERATOR

Original Filed June 6, 1919 4 Sheets-Sheet 1

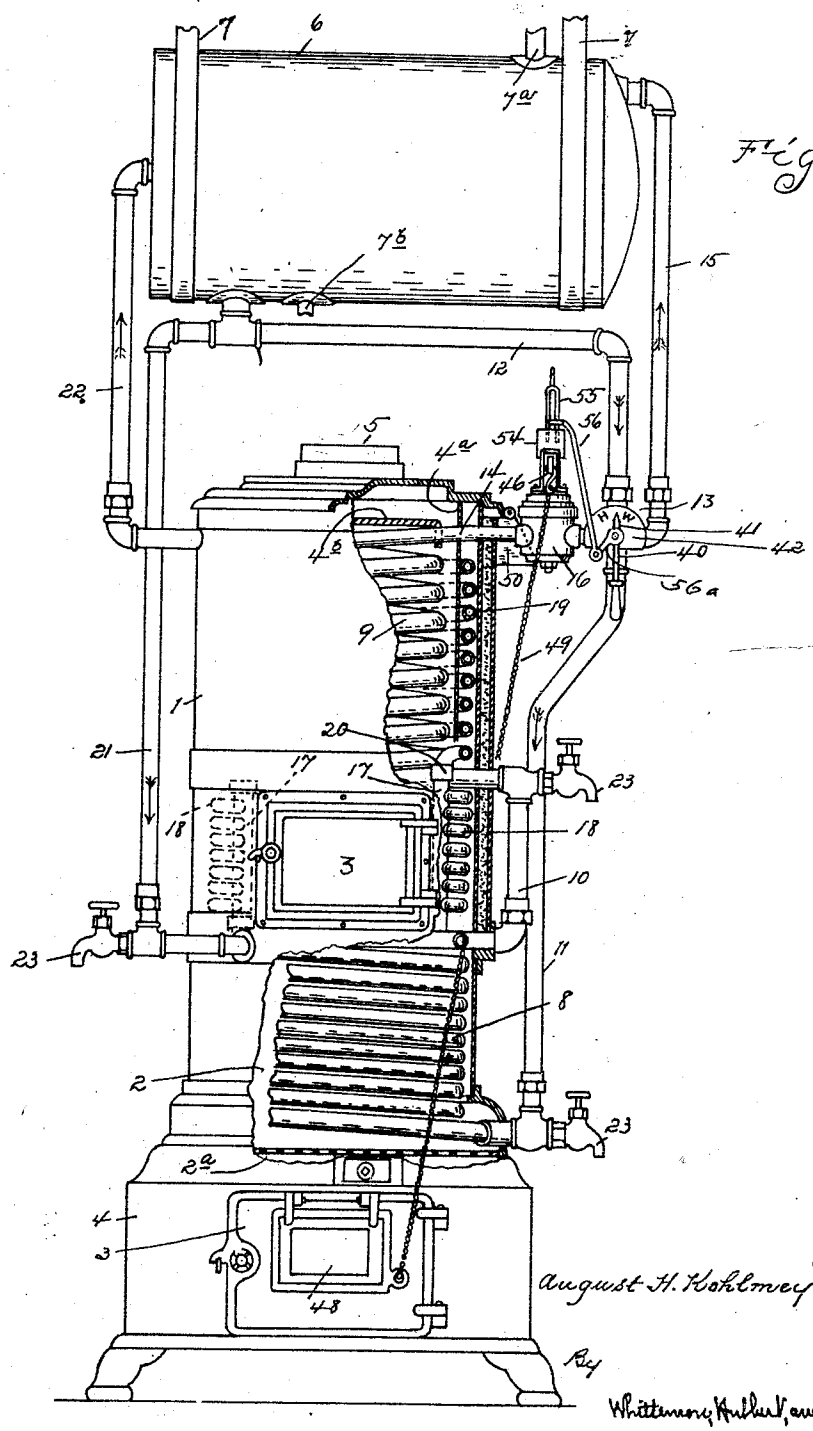


Fig. 1.

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Original Filed June 6, 1919 4 Sheets-Sheet 2

Fig. 2

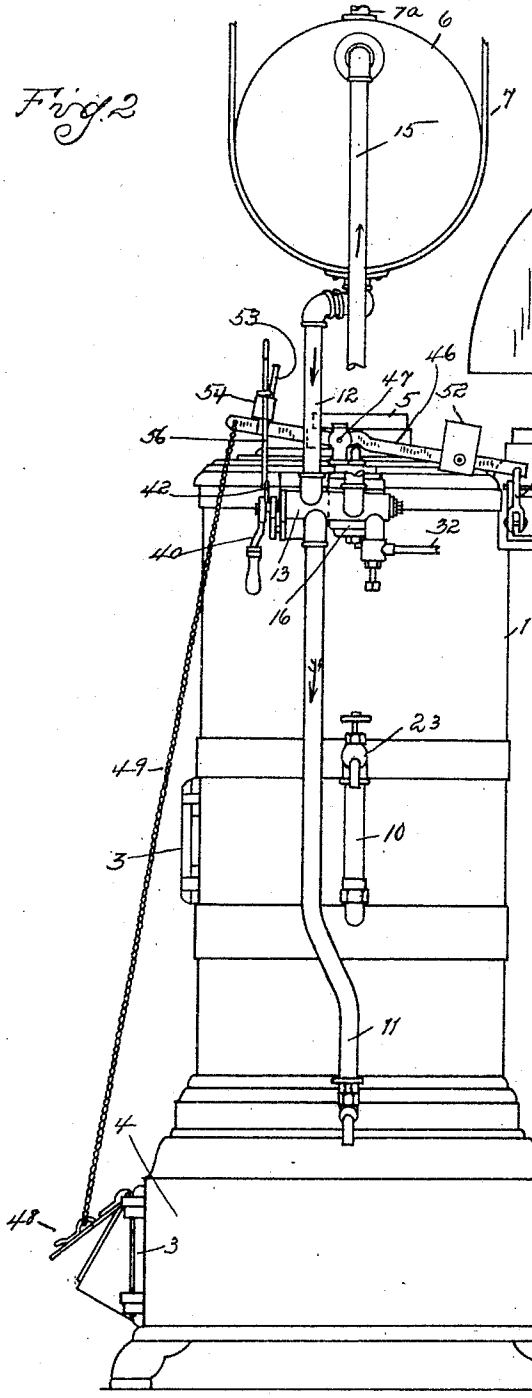
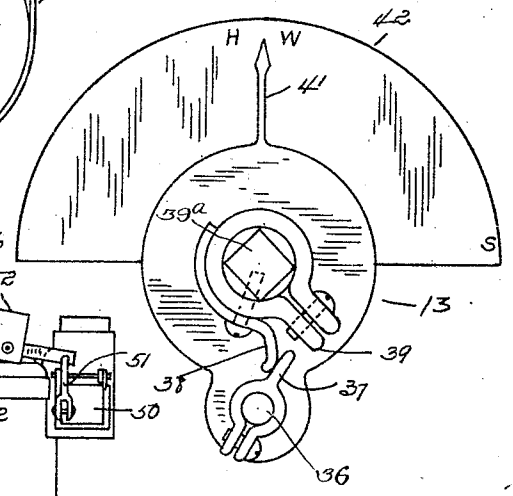


Fig. 7.



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Original Filed June 6, 1919 4 Sheets-Sheet 3

Fig. 4.

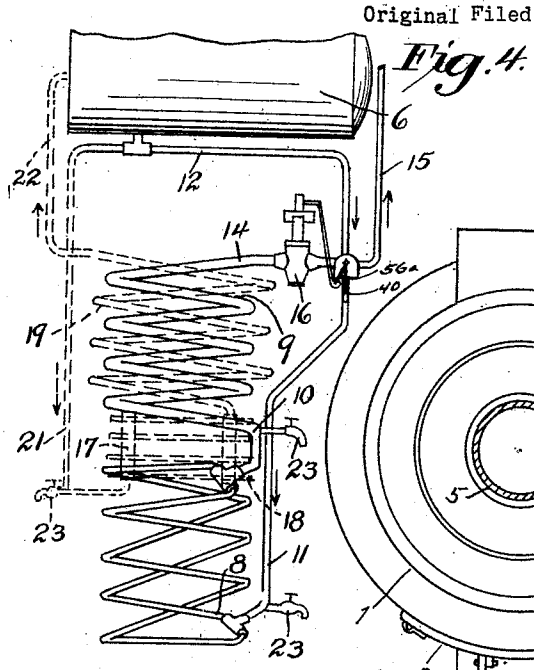


Fig. 3.

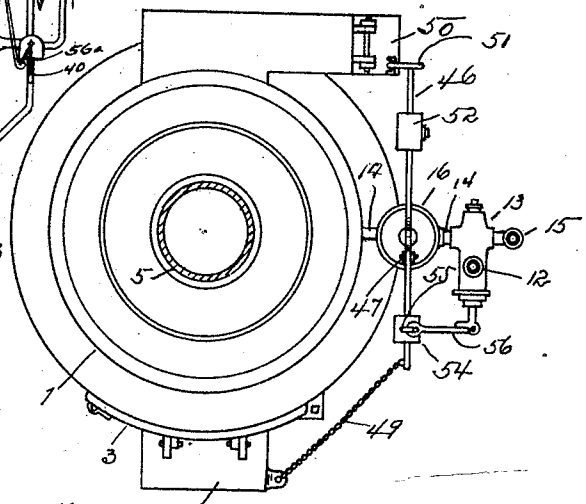


Fig. 8.

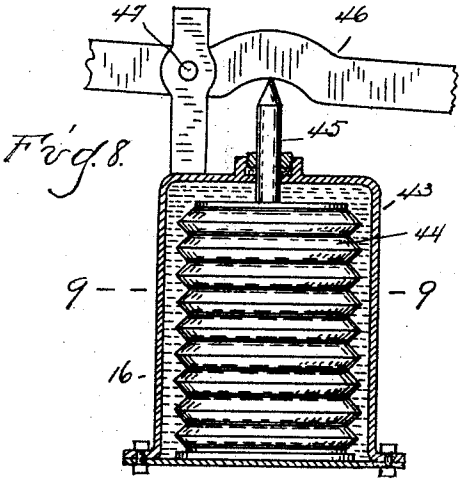
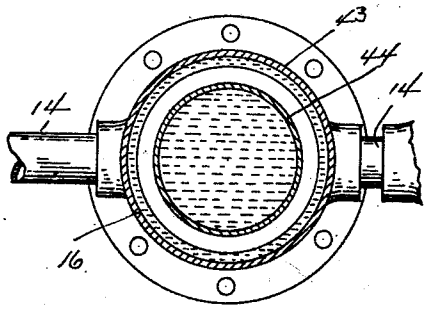


Fig. 9.



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WATER HEATER AND STEAM GENERATOR

Original Filed June 6, 1919 4 Sheets-Sheet 4

Fig. 5

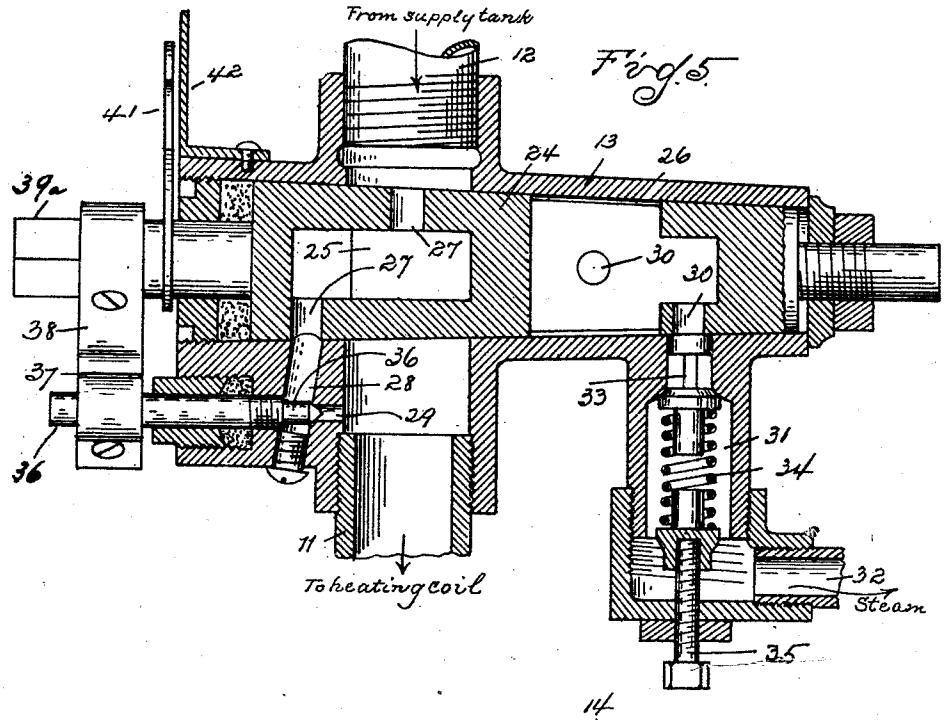
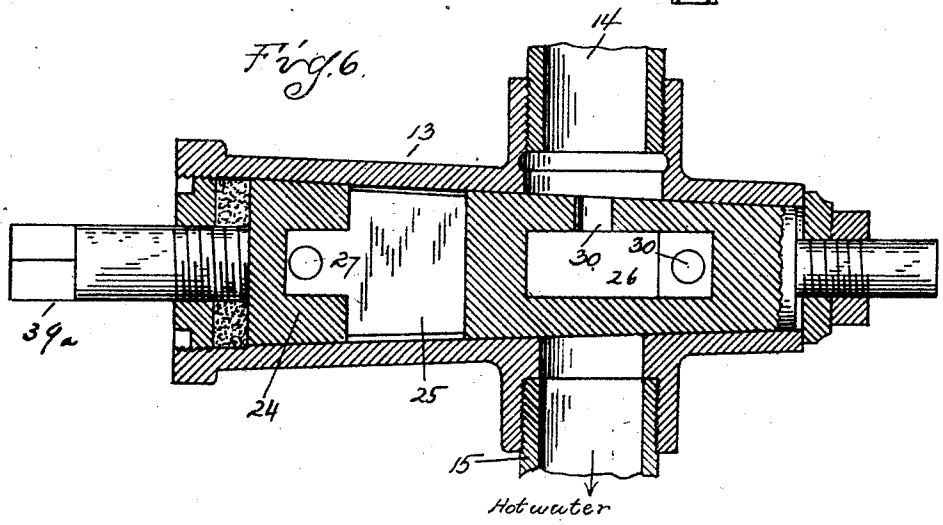


Fig. 6.



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UNITED STATES PATENT OFFICE.

AUGUST H. KOHLMEYER, OF DETROIT, MICHIGAN.

WATER HEATER AND STEAM GENERATOR.

Application filed June 6, 1919, Serial No. 302,181. Renewed October 24, 1924.

To all whom it may concern:

Be it known that I, AUGUST H. KOHLMEYER, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Water Heaters and Steam Generators, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to combined water heaters and steam generators, and particularly relates to such devices as employ the same coils or other containers for alternatively heating water and generating steam.

It is the object of the invention to subject a thermostat to the temperature of the hot water or steam produced by such a device and to provide mechanism actuable by said thermostat for automatically regulating the application of heat to the water.

In the use of the invention in connection with a water heater having a fire-box or combustion chamber, it is an object of the invention to regulate the draft to said fire-box automatically by means of a thermostat subjected to the temperature of the hot water or steam produced by the device.

It is an object of the invention also to secure an automatic increase in the amount of heat applied to the coils or other container when the apparatus is changed over from a water heater to a steam generator.

The invention further consists in the various structural features and arrangement of parts as hereinafter fully described.

In the drawings:

Figure 1 is a view in front elevation of an apparatus constructed in accordance with the invention, a portion of the casing thereof being broken away to show interior features;

Figure 2 is a side elevation of the same;

Figure 3 is a plan view omitting the water tank which Figures 1 and 2 disclose;

Figure 4 is a diagrammatic view showing the arrangement of water coils in the heater;

Figure 5 is a vertical sectional view of the main valve controlling the water supply to the heater and controlling also delivery of steam or water therefrom;

Figure 6 is a horizontal sectional view of the same;

Figure 7 is an end view of the same;

Figure 8 is a vertical sectional view of the thermostat employed in the invention;

Figure 9 is a horizontal sectional view of the same, the section being taken on the line 9—9 of Figure 8.

In these views, the reference character 1 designates the casing of a combined water heater and steam generator, said casing being preferably formed of sheet metal and cylindrical in shape. In the lower portion of said casing a fire-box 2 is formed above the grate 2^a, 3 being the usual fuel feed door giving access to the fire-box. Below the grate 2^a the usual ash-pit 4 is provided. In the upper portion of the casing 1 there is provided a drum 4^a, preferably depending from the top of the casing 1 and spaced slightly inwardly from said casing. In the upper portion of said drum there is arranged a horizontal baffle plate 4^b, whereby the hot gases arising from the fire-box are directed into proximity with the coil 9 and drum 4^a as they rise toward the smoke outlet 5.

With the water heater proper there is associated a hot water tank 6, preferably located above the water heater proper, as shown in Figures 1 and 2, said tank being supported by hangers 7 and having inlet and outlet pipes 7^a and 7^b, respectively communicating with its top and bottom.

Within the casing 1 there are located the water heating coils 8 and 9, the former forming a lining for the fire-box and the latter being located within the drum 4^a, a series connection between said coils being established exteriorly of the casing 1, as indicated at 10. The coil 9 is formed of larger pipe than the coil 8 for the reason that the latter is a double coil providing two paths for the water (see Fig. 4). Pipes 11 and 12 form a line through which the water passes from the tank 6 to the lower end of the coil 8, control valve 13, hereinafter specifically described, being located between said pipes. The return of the circulating water to the tank takes place through a line formed by pipes 14 and 15, said pipes having interposed therebetween the valve casing 13 and also a thermostat 16, the function of which is hereinafter made clear.

At each side of the fuel feed door there is disposed a water header 17, the two headers being connected by spirally inclined pipes 18 extending adjacent to the side and rear

portions of the casing 1. Between the upper portion of said casing and the drum 4ª there is arranged a coil 19 which communicates with one of the headers 17, as is indicated at 20. Circulating water is delivered to the heating pipes 18 and 19 by the pipe 21 from the tank 6, said pipe communicating with the lower extremity of one of the headers 17, the return to the tank being through the pipe 22 which connects with the upper end of the coil 19. A number of faucets 23 are suitably arranged for flushing out the several heating pipes when desired, which faucets may be used also to draw off hot water.

Describing now the specific construction of the control valve, the reference character 24 designates a tapering plug fitting within the correspondingly shaped casing 13 and provided with the axially spaced ports 25 and 26 extending transversely therethrough and having their axes 90° apart, the former being adapted to register with the aligned pipes 11 and 12 and the latter registrable with the pipes 14 and 15. The port 25 has two relatively small ports 27 connecting therewith in a direction transverse thereto, one of said small ports being positioned to communicate with the pipe 12, when the plug is properly adjusted, in which position of the plug the other port 27 registers with a by-pass 28 having the discharge opening 29 leading to the pipe 11.

The port 26 has communicating therewith two small ports 30, one of which is adapted to register, when the plug is properly adjusted, with the pipe 14, while the other in said position of the plug communicates with a valve chamber 31 and through said chamber with the steam delivery line 32. Within said chamber 31 is located the check-valve 33 opposing the passage of steam from said chamber to the pipe 32, said valve being normally held seated by a spring 34, the tension of which is regulable by means of the adjusting screw 35.

The opening 29 leading from the by-pass 28 is adapted to be closed by a stem 36, screw-threaded in the lower portion of the casing 13 and consequently adjustable through rotation to or from its seat. Said stem is actuable through rotation of the plug 24, being provided exteriorly of the casing with the lug 37 which is engageable by a pair of lugs 38 and 39 carried by the stem 39ª of the plug for imparting a rotation to said stem 36 when the plug is turned by means of its handle 40. Upon the stem 39ª of the plug there is furthermore mounted a pointer 41 with which is associated an indicator plate 42 carried by the casing 13, said plate being marked at points 90° apart HW and S to indicate the proper positions of the plug for respectively adapting the apparatus to function as a water heater or a steam generator.

The thermostat comprises the casing 43 arranged in the pipe line 14 and having therein the expansible chamber 44 which in expanding or contracting in response to variations of temperature in the fluid passing through the casing 43 actuates the stem 45 upwardly projecting through said casing. Said stem at its upper end is beveled to secure a point bearing upon a lever 46 pivoted at 47 upon a lug carried by the casing 43 closely adjacent to said actuating stem. The movement of said lever is adapted to automatically control the opening of the draft door 48 which communicates with the ash-pit, this control being established by the chain 49 extending from the front end of the lever 46 to the door 48. The movement of the lever 46 is further adapted to control the opening of the check-draft door 50 at the rear of the casing 1, this control being established through the linkage 51. Upon the lever 46 there is adjustably mounted a weight 52, the purpose of which is to provide a resistance to the movement of the lever actuated by the thermostat as a result of a rise in temperature, said weight being adjusted to determine the maximum desired temperature of the water or steam, the effect of the thermostat being to cut off the draft when said temperature is reached.

Means are furthermore provided for producing an automatic adjustment of the thermostat mechanism when the handle 40 is adjusted to shift the plug 24 to its position for steam generation. Thus, an arm 53 projects upwardly from the forward portion of the lever and slidably carries the weight 54. Said weight has a headed pin 55 projecting upwardly therefrom, said pin being arched or staple-like in the disclosed embodiment of the invention, which pin is engaged by one end of a link 56 having its other extremity pivoted to an arm 56ª rigidly connected to the handle. Thus when the handle is swung from the hot water to the steam position, the link 56 initially slides upward upon the pin 55 and during the latter part of the movement of the handle, said link engages the head of the pin and raises the weight 54, so as to free the lever of the restraint exercised by said weight and resisting increase of draft.

Discussing now the operation of the above described apparatus, it is to be understood that the coils 8 and 9 form a water vessel which is adapted for alternative use either for heating water or for generating steam, the quantity of water fed to said coils when the same function merely as a heater being equal to the full capacity of the coils while said quantity is considerably reduced when it is desired to generate steam. This change in the quantity of water fed to the coils is effected by an adjustment of the valve 13 which, as disclosed in Figures 5 and 6, is

in a position to permit a restricted flow which adapts the coils to function as a steam generator. Thus, in said figures it is seen that the comparatively small ports 27 are in registration respectively with the pipes 12 and by-pass 28, so that the flow of water through the plug is quite limited. Because of the concentration of the heat in the fire-box upon this limited supply of water, steam is generated in the coils 8 and 9 and more particularly in the former coil, which since it forms a casing for the fire-box is subjected to the higher temperature, the coil 9 functioning primarily as a super-heater and drier for the steam. The steam after passing through the coils 8 and 9 enters the plug 24 through one of the ports 30 passing out through the other into the valve chamber 31 and thence to the steam delivery pipe 32. By properly adjusting the check-valve 33 the pressure, and consequently the temperature, under which the steam is delivered may be accurately regulated.

When the plug is adjusted at 90° to the position shown in Figures 5 and 6, the port 25 registers with the pipes 11 and 12, while the port 26 registers with the pipes 14 and 15. Thus, a supply of water equal to their full capacity is admitted to the coils 8 and 9 and is conducted from said coils back to the tank by way of pipe 15.

The pipes 18 and coil 19 form what may be termed an economizer circuit, establishing a circulation system, together with the tank 6, and taking up a certain amount of heat from the furnace that otherwise might be uselessly dissipated.

Since the water or steam produced by the apparatus passes through the thermostat casing 43, any increase of temperature in said water or steam tends to produce an expansion and a consequent upward movement of the stem 45, while a decrease of temperature produces a reverse effect. By shifting the weight 52 toward the fulcrum of the lever, the resistance to swinging of the lever, due to a rising temperature is diminished so that with a lesser maximum temperature, the draft door 48 will be closed and the check damper 50 open. By shifting the weight 52 toward the rear end of the lever 46, the resistance to expansion of the thermostat is increased so that a higher temperature will be necessary to effect damping of the fire.

Since for the generation of steam it is desirable to have a hotter fire than is requisite for the production of hot water, the lever 46 carries the auxiliary weight 54 which, when the apparatus is used for hot water, exerts a constant tendency to swing the lever so as to diminish the draft while upon adjusting the plug 24 for a steam generation, said weight 54 is raised by the link 56, relieving the lever of the restraining action of said weight so that there will be an immediate tendency for the draft door of the ash-pit to open and for the check damper 50 to close.

While the invention has been particularly described in its application to an apparatus having a fire-box for solid fuel, it is evident that the same principles of construction and operation may be employed where the fuel is in the nature of liquid or gas.

The invention has a special application for use in laundries and restaurants and is applicable further for use in numerous factory industries where the alternative use of water and steam is required.

What I claim as my invention is:

1. In a combined water heater and steam generator, the combination with a heating vessel, a tank, alternative means for connecting said vessel to said tank to form a water circulating system and for operating said vessel independently of said tank, as a steam generator, of means for heating said vessel, a thermostat subject to the temperatures of the hot water and steam produced in said vessel, mechanism actuable by said thermostat for automatically regulating said heating means, and means for automatically adjusting the thermostatic mechanism to increase the application of heat by said heating means to the vessel when the same is connected for use as a steam generator.

2. In a combined water heater and steam generator, the combination with a vessel alternatively used for heating water and generating steam, of a thermostat subject to the temperatures of the hot water or steam produced in said vessel, means for heating said vessel, mechanism actuable by said thermostat for automatically regulating said heating means, a valve controlling the water supply to said vessel and adapted to increase or diminish said supply according as the vessel is employed for heating water or generating steam, and means acting in unison with said valve for adjusting the thermostatic mechanism to increase the application of heat by said heating means to said vessel when the same is used as a steam generator.

3. In a combined water heater and steam generator, the combination with a vessel alternatively used for heating water and generating steam, of a fire-box for heating said vessel, a thermostat subject to the temperatures of the hot water or steam produced in said vessel, mechanism actuable by said thermostat for automatically regulating the draught to said fire-box, a valve controlling the water supply to said vessel and adapted to increase or diminish said supply according as the vessel is employed as a water heater or steam generator, and

means actuable in unison with said valve for adjusting the thermostatic mechanism to increase the draught to the fire box when the same is employed as a steam generator.

4. In a combined water heater and steam generator, the combination with a vessel alternatively used for heating water and generating steam, of means for heating said vessel, a thermostat subject to the temperatures of the hot water or steam produced in said vessel, a lever actuable by said thermostat, mechanism actuable from said lever for automatically regulating said heating means, a weight adjustable upon said lever for resisting an increase in the application of heat by said heating means to the vessel, and means for automatically relieving the lever of said weight when the apparatus is changed over from a water heater to a steam generator.

5. In a combined water heater and steam generator, the combination with a vessel alternatively used for heating water and generating steam, of means for heating said vessel, a thermostat subject to the temperatures of the hot water or steam produced in said vessel, a lever actuable by said thermostat, mechanism actuable from said lever for automatically regulating said heating means, a weight adjustable upon said lever for resisting an increase in the application of heat by said heating means to the vessel, a valve adjustable to increase or diminish the supply of water to the vessel according as the latter is employed as a water heater or a steam generator, means for actuating said valve and a link actuable by said means engaging said weight for relieving the lever of the weight when the valve is adjusted to adapt the vessel for use as a steam generator.

In testimony whereof I affix my signature.

AUGUST H. KOHLMEYER.