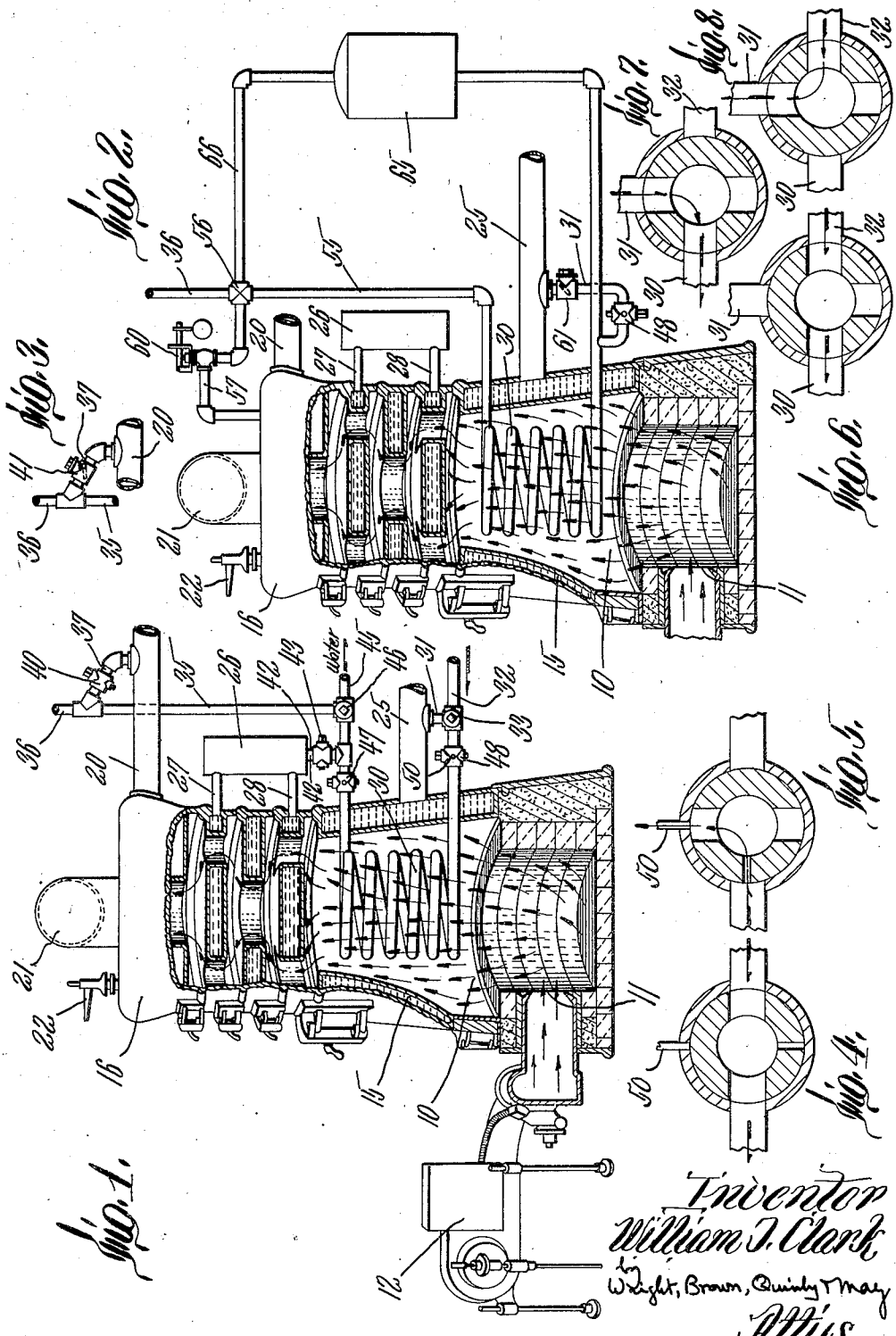
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HEATING APPARATUS

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HEATING APPARATUS

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This invention relates to heating apparatus for supplying heat to buildings, and more especially to heating apparatus for dwellings and similar structures. Domestic heaters, whether of the steam or hot-water type, usually include a boiler with a considerable water capacity. In most cases, the boiler is one originally designed for a solid fuel such as coal, coke or wood. When such a boiler is provided with an oil burner, the burner is ordinarily inserted in the ash pit, with the result that a comparatively large space originally designed for a bed of solid fuel is left empty. If the water in a boiler of this type is allowed to cool to any considerable extent, it takes some time to heat up again after the oil flame is started. For example, in a thermostatically-controlled oil-burning system, it is often the practice to maintain the house at night at a considerably lower temperature than during the day. Thus, when the thermostat is set for day temperature, a considerable interval may be required to heat up the water in the boiler sufficiently to heat the radiators. According to the present invention, the empty space in the fire-box is put to use for the purpose of obtaining a quicker response to the starting of the oil-firing apparatus, whereby a limited amount of steam or hot water is delivered preferably to a selected radiator before the main boiler can deliver heat, and of materially economizing on the fuel oil required to heat the structure.

These and other beneficial results are attained by installing an auxiliary boiler unit in the fire-box in such a way as to be exposed directly to the hottest combustion gases, but not to interfere with the draft of the furnace. Such an auxiliary unit may be in the form of a coil of copper pipe, such coil having a relatively small water capacity so that the contents of the pipe are quickly heated when the oil firing apparatus starts. The auxiliary unit can be connected, as hereinafter more fully described, in several ways to the other portions of the heating systems so as to serve as a booster for the main boiler or as a feeder for the steam or hot-water main, or as a heater for the domestic water supply.

For a more complete understanding of the invention, reference may be had to the description of certain embodiments thereof which follows, and to the drawing, of which

Figure 1 is an elevation, partly in section, of heating apparatus embodying the invention.

Figure 2 is a similar view of a modified form of the invention.

Figure 3 is an elevation of a portion of the apparatus shown in Figure 1, showing a modification.

Figures 4 and 5 are diagrammatic views of a waste cock showing two positions of operation.

Figures 6, 7 and 8 are diagrammatic views of a three-way cock showing different positions of operation.

For purposes of illustration, the invention is shown as embodied in a steam heating system, but it is to be understood that the invention in its broader aspects is applicable also to other types of systems, such as hot water, vacuum steam, or combinations of such systems. In Figure 1 a domestic heating unit is shown, partly in section. This heating unit may comprise a boiler having a fire chamber 10 for the combustion of fuel oil supplied through an inlet 11 from any suitable apparatus 12, a water chamber 15 around and above the fire chamber 10, and a steam dome 16 above the water chamber. A main steam line 20 leads from the steam dome, a smoke pipe 21 being supplied to carry off the combustion gases from the fire chamber 10. A safety relief valve 22 may be mounted on the steam dome in the customary manner. A condensate return pipe 25 opens into the water chamber 15, preferably near the lowermost point thereof. As is customary in single-pipe domestic installations, the steam main 20 may be led around in a suitable circuit terminating in the condensate return pipe 25, radiator service pipes branching off from the steam main as required. A reservoir 26 for the water gage may be mounted beside the boiler and may be connected thereto by pipes 27 and 28 entering the boiler respectively above and below the normal water level therein.

According to the invention, I mount an auxiliary boiler unit 30 in the fire chamber where it will be directly exposed to the hot combustion gases for rapid heating. This auxiliary unit may be of any preferred construction. As shown, it may consist of a number of coils of pipe (preferably copper or brass) for rapid conduction of heat, the lower end of the coil being connected to the condensate return pipe 25 as by a connecting pipe 31. As shown in Figure 1, the lower end of the coil 30 may also be connected to a feed-water pipe 32 as well as to the connecting pipe 31, through a three-way cock 33, such a cock being diagrammatically illustrated in Figures 6, 7 and 8. It is evident that the cock 33 may be used to supply feed water for the main boiler when turned to the position indicated in Figure 8. The auxiliary unit 30 may be connected to the water chamber 15 through the condensate return pipe

35 when the cock 33 is turned to the position illustrated in Figure 7. The auxiliary heating unit 30 can also be connected directly to the water supply pipe 32 by turning the cock 33 to the position shown in Figure 6, the cock being turned to this position when the coil 30 is to be used for providing a hot water supply for the house, as hereinafter described. The upper end of the coil 30 leads through a connecting pipe 35 to a radiator service pipe 36, the latter being also connected as by a pipe 37 to the main steam line 20. If desired, a stop cock 40 may be in the pipe 37 so that the connection between the service pipe 36 and the steam main 20 may be wide open, fully closed or partly closed. If desired, a check valve 41, as illustrated in Figure 3, may be employed instead of a stop cock 40, the valve 41 being adapted to permit free flow of steam from the main 20 into the service pipe 36 but to check the flow in the opposite direction. The valve 41 is preferably provided with a small hole through the valve member so that a small reverse flow from the service pipe 36 to the steam main is permitted.

Similarly, preferential response in favor of a particular radiator may be had in a hot-water house-heating system, by connecting the upper end of the auxiliary coil 30 to a selected radiator service pipe.

If desired, the upper end of the coil 30 may be connected through a branch pipe 42 to the gage reservoir 26, a stop cock or valve 43 being provided in this connecting pipe so that flow therethrough can be cut off entirely. The upper end of the coil 30 may be connected also to a water pipe 45 as well as to the connecting pipe 35 through a three-way cock 46, this cock being similar in structure to the cock 33. It will be evident from an inspection of the apparatus shown in Figure 1 that the auxiliary coil 30 can be used in three ways: first, to provide quick heat for the radiator served by the pipe 36; second, to accelerate the heating of the water in the main boiler; or third, to heat the running hot-water supply for the house.

When the apparatus 12 is started by a thermostat or otherwise to provide a flame in the fire box, the coil 30, having a comparatively small water capacity, heats quickly and soon sends up steam. If the cocks 33 and 46 are in the positions shown in Figure 7 and the cock 43 is shut, the steam generated in the coil 30 will rise through the pipe 35 into the connecting pipe 36 and will heat the radiator connected thereto before steam is supplied to the other radiators in the house. This will ordinarily take place whether or not the cock 40 is open, owing to the Y connection between the pipes 35, 36 and 37. In fact, in most cases the cock 40 can be omitted. Thus there is naturally a preferential supply of steam to the pipe 36. This preference can be augmented by partly closing the cock 40 or by the use of a check valve 41. When the radiator attached to the service pipe 36 has become heated so that its air escape is closed, further supply of steam will find its way into the steam main so as to augment the steam which is ultimately supplied from the steam dome 16.

Instead of or in addition to the use of the auxiliary coil 30 for providing a preferential supply of steam for a single radiator, it can also be used as a booster for more rapidly heating the water in the water chamber 15. This occurs if the cock 43 is open since the heated water in the coil 30 tends to cause a circulation into the upper portion of the water chamber through the pipe 28 and back into the coil 30 through the pipe 31.

In warm weather when the operation of the heating plant is not desired for heating the house, but a running hot-water supply is desired, the coil 30 can be connected directly into the water piping system by turning the cocks 33 and 36 to the position shown in Figure 6 and shutting off the cock 43. This disconnects the coil 30 from the heating system and connects it in series with the water supply and discharge pipes 32 and 45.

In order to permit the complete disconnection of the coil from both the water and steam systems, I may insert in the pipes leading from the upper and lower ends of the coils waste cocks 47 and 48. By turning these cocks to the position shown in Figure 5, the coil is shut off from all connections and vents 50 are opened to drain the coil.

Figure 2 illustrates a modified embodiment of the invention. As therein shown, the upper end of the coil 30 is connected as by a pipe 55 through a cross connection 56 to a radiator service pipe 36. From the connection 56 a pipe 57 leads into the steam dome 16 or the main steam line 20, according to convenience. In the pipe 57 is a relief valve 60 which is adjustable so that pressure in the coil 30 exceeding a predetermined amount can be relieved into the main steam system. The lower end of the coil 30 is connected to the condensate return pipe 25 through a check valve 61 which is adapted to permit one-way flow from the return pipe 25 into the coil 30. The coil 30 may also be connected to an auxiliary water tank 65. It is evident that, when combustion is started in the fire chamber, the water in the coil 30 will steam before the water in the main boiler. This steam will be sent up into the service pipe 36 and into any other service pipes which may be connected thereto so that certain of the radiators in the house will be first to receive steam. Since the check valve 61 is between the lower end of the coil 30 and the pipe 25, pressure will ordinarily be built up in the coil 30 which will force the steam through the pipe 36 into the radiator or radiators connected thereto. If this pressure exceeds a predetermined amount, the excess will be relieved through the valve 60 into the steam dome 16. The function of the auxiliary water tank 65 is to provide an extra supply of water from the coil 30 during the period when the water supply for the coil 30 from the pipe 25 is cut off by pressure on the valve 61. A connecting pipe 66 preferably leads from the reservoir 65 to the pipe 55 at a point above the water level in the main boiler. As shown, the pipe 66 may lead to the cross connection 56. This results in equalization of water level in the tank 65 and the pipe 55 at all times, the water level in the tank 65 and the main boiler being equal when there is no steam pressure in the coil 30.

The auxiliary boiler unit in the fire chamber not only results in a quicker response in the system to the fire in the fire-box, but also results in a more efficient utilization of the heat of the combustion gases, so that a marked saving in fuel consumption is effected by the installation thereof.

It is evident that various modifications and changes may be made in the details of structure shown and described without departing from the spirit or scope of the invention as defined in the following claims.

I claim:—

1. In a steam heating system, a boiler having a fire chamber, a water chamber and a steam dome, a main steam line and a condensate return

connected to said boiler, a service line for a radiator connected to said main line, an auxiliary coil of pipe mounted in said box, means connecting the lower end of said coil to said condensate return, a connecting pipe from the upper end of said coil to said service pipe, a branch pipe from said connecting pipe to said water chamber, and a valve in said connecting pipe.

2. In combination with a steam-heating system which includes a boiler having a fire chamber, water chamber and steam dome, and a main steam line leading from said steam dome; an auxiliary pipe coil mounted within said fire chamber so as to be exposed to combustion gases, the lower end of said coil communicating with said water chamber, the upper end of said coil having connections leading respectively to said main steam line and to said water chamber, and valve means for regulating the relative amounts of opening of said connections.

3. In a heating system, a boiler having a fire chamber, a water chamber and steam dome, an auxiliary boiler unit mounted in said fire chamber, a feed water pipe for said boiler, means for connecting the lower portion of said auxiliary unit selectively to said water chamber or to said feed water pipe, a water discharge pipe and means for connecting the upper portion of said auxiliary unit selectively to said water chamber or to said steam dome or to said water discharge pipe.

4. In a steam-heating system, a boiler having a fire chamber, a water chamber and a steam dome, an auxiliary boiler unit mounted in said fire chamber, a radiator service pipe, a connection from said auxiliary unit to said service pipe, said connection having a branch leading to said steam dome, a relief valve in said branch adjusted to permit the escape of steam from said connection into said dome when the steam in said connection exceeds a predetermined pressure, means connecting the lower part of said auxiliary unit to said water chamber, said means including a check valve permitting one-way flow from said water chamber into said auxiliary unit.

5. In a steam-heating system, a boiler having a fire chamber, a water chamber and a steam dome, an auxiliary boiler unit mounted in said fire chamber, a steam delivery line leading from the upper portion of said auxiliary unit, a water return line leading from said delivery line to the lower portion of said auxiliary unit, a water reservoir connected to said water return line, a connection between said water return line and said water chamber having a check valve therein to permit one-way flow from said water chamber to said water return line, and a relief connection between said steam delivery line and said steam dome adapted to permit escape of excess pressure from said delivery line into said steam dome.

6. In a heating system, a boiler having a fire chamber, a delivery pipe line leading from the upper portion of said boiler, a return pipe line leading to the lower portion of said boiler, an auxiliary coil mounted in said fire chamber for exposure to combustion gases therein, means connecting the lower end of said coil to said return pipe, means connecting the upper end of said coil to the upper portion of said boiler, branch means connecting the upper end of said coil to said delivery line at a point spaced from said boiler, and valve means for controlling each of said connecting means.

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