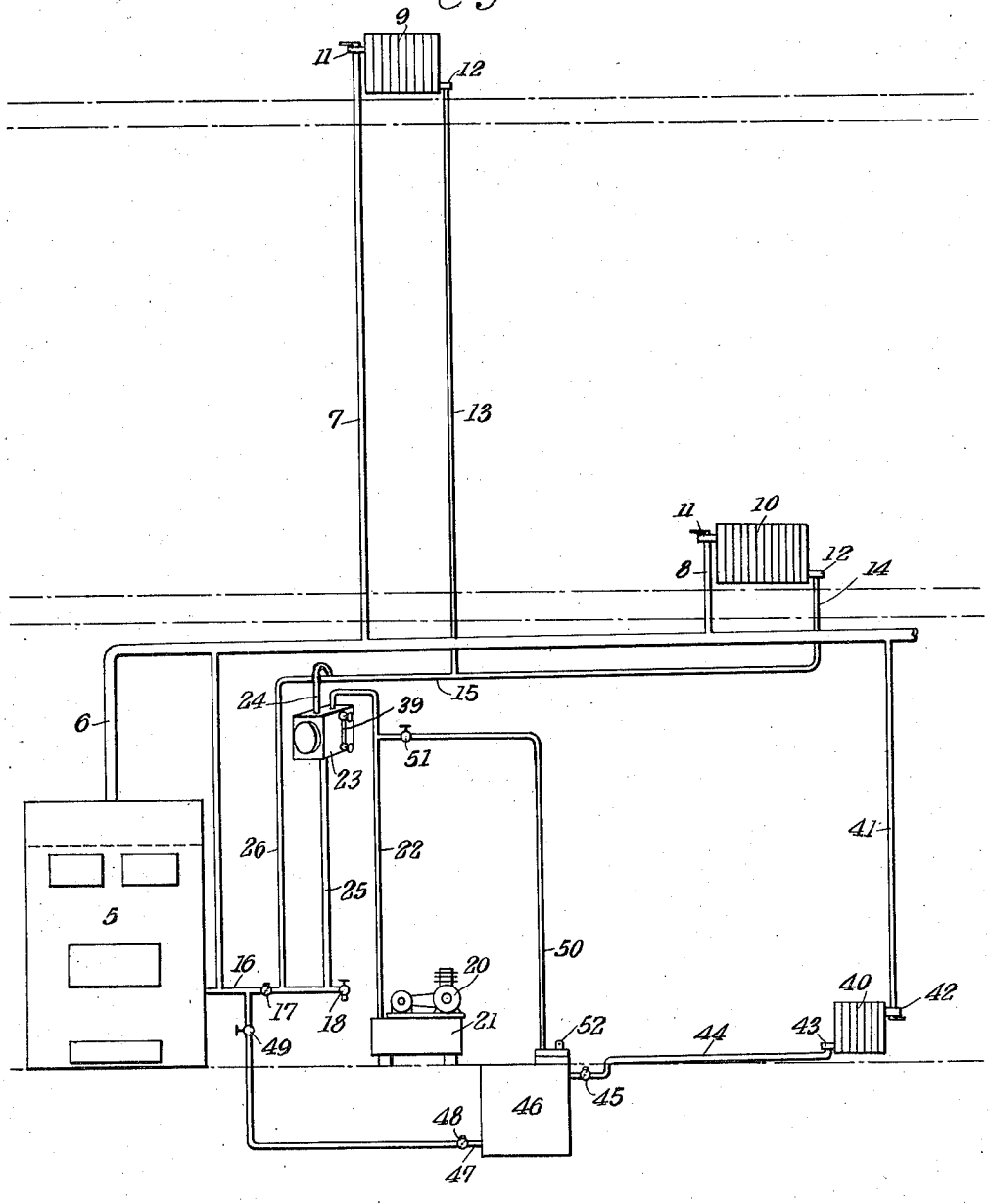
Oct. 4, 1938. G. W. PARKTON 2,131,901

VACUUM HEATING SYSTEM

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Fig. 1.



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Fig. 2.

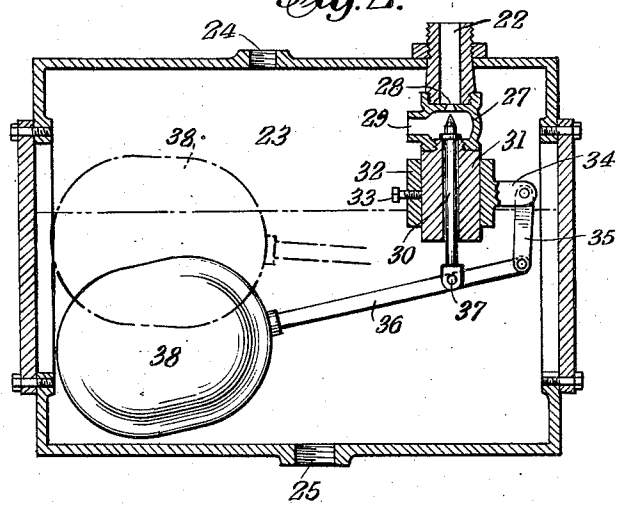
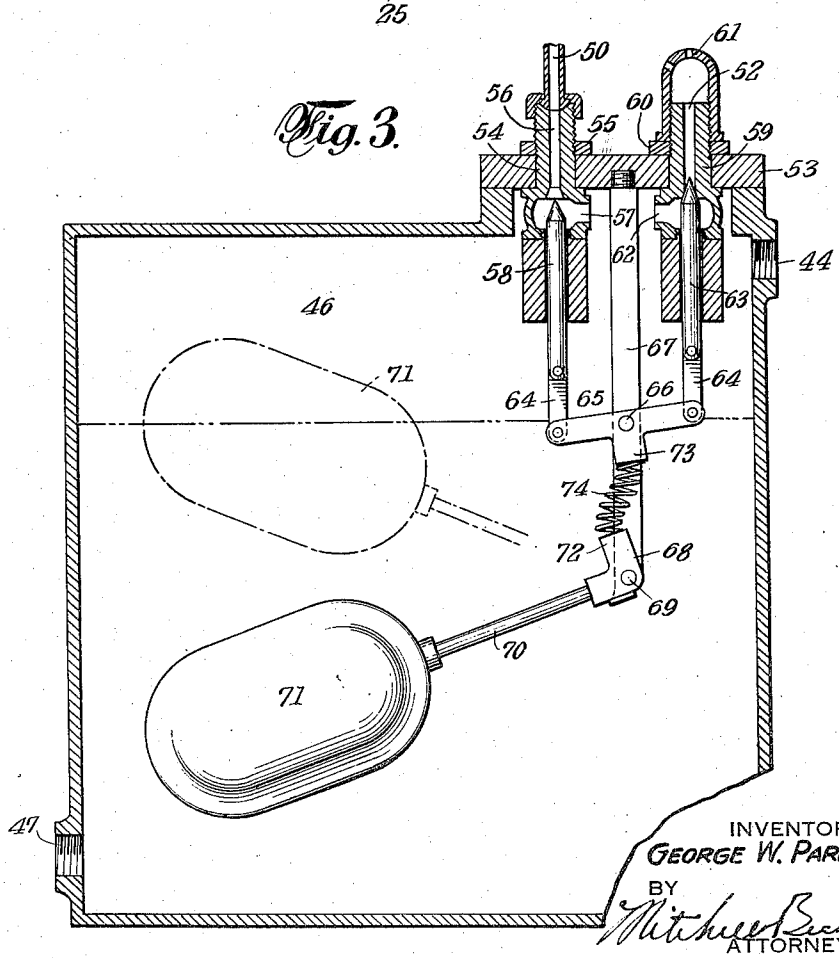


Fig. 3.



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VACUUM HEATING SYSTEM

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2 Claims. (Cl. 237—67)

My invention relates to a high vacuum heating system.

In a vacuum heating system steam or vapor is generated at a lower temperature than in an atmospheric or pressure system. In the high vacuum heating systems with which I am familiar a reduced pressure is induced in the return line from the radiators and the condensate or return water is usually returned to the boiler by a pump. I propose to eliminate the expense of a condensate return pump and the expense of operation and maintenance thereof.

It is an object of my invention to provide a high vacuum heating system provided with improved means for permitting the return water to feed back to the boiler by gravity.

Briefly stated, in a preferred form of the invention I employ a boiler for generating steam or vapor and feeding the same to radiators, the steam or vapor being preferably controlled at the radiators by modulating valves. The radiators are preferably provided with thermostatic traps of any usual or preferred form for permitting the flow of condensate to the return lines but preventing free passage of steam or vapor. The return line is connected to a vacuum pump or vacuum tank for inducing low pressure in the return line in the usual manner. The return water is permitted to collect and build up in a pipe or reservoir system to a point above the water line in the boiler. An improved float system is arranged so that when the return water builds up to a predetermined level above the water level in the boiler the connection to the vacuum tank or pump is cut off and the pressure in the return line and in the boiler is partially equalized, that is, equalized to such an extent that the collected return water may flow by gravity past a check valve and into the boiler. When the level in the return water pipe system or reservoir has dropped to a predetermined level a float, the position of which is controlled by the return water level, again opens the connection to the vacuum tank and a higher differential is again established between the boiler and the return line.

In such heating installations as require that radiators be placed so low as to require the return line to be below the water level in the boiler I provide a receiving reservoir or pipe system for such low returns and connect such reservoir to the vacuum pump or tank so as to provide the usual differential between the boiler and the return line in such low radiators. The return water collects in the low return water reservoir and the return water level rises to a predetermined point. A float mechanism serves to cut off the connection to the vacuum tank and preferably opens an atmospheric connection so that the atmospheric pressure is sufficient to force the water from the low return water tank into the boiler which is below atmospheric pressure.

In the drawings which show, for illustrative purposes only, a preferred form of the invention—

Fig. 1 is a diagrammatic view of a high vacuum heating system and illustrating features of the invention;

Fig. 2 is an enlarged sectional view of a float reservoir for return water, placed above the water level in the boiler; and

Fig. 3 is a similar view of a reservoir for return water from radiators located below the water level in the boiler.

Fig. 1 illustrates radiators placed both above and below the water level in the boiler but it is to be understood that where all radiators are placed above the boiler water level some features illustrated in Fig. 1 may be omitted and, of course, if all radiators were placed below the boiler water level certain other features could be omitted, as will be later explained.

In said drawings 5 indicates a boiler of any conventional or desired type having a steam or vapor line 6 delivering through branch pipes 7—8 to radiators 9—10 placed above the water level of the boiler, for example, on the first and second floors of a dwelling. The pipes 7—8 communicate with the radiators, preferably through modulating valves 11, so that the steam or vapor flow may be controlled for each individual radiator. Thermostatic traps 12 are preferably connected to the radiators so as to permit the free passage of air and return water but prevent the passage of steam or vapor. The radiators beyond the thermostatic traps 12 are connected by means of branch pipes 13—14 with the main return line 15, which is connected to the boiler by a pipe 16, in which is a check valve 17 opening toward the boiler. The pipe 16 may be provided with a drain valve 18, if desired.

It will be understood that in a high vacuum heating system (from a perfect vacuum down to say 8 or 10 inches of mercury) the differential pressure between the return line 15 and the steam or vapor line 6 is quite considerable and the return water would not return by gravity to the boiler. I have provided means, however, for permitting a return of the condensate to the boiler without the aid of the usual boiler return

pump heretofore employed with a high vacuum heating system.

In the form illustrated I employ a vacuum pump 20, operated as by means of an electric motor, for exhausting a vacuum tank 21. The vacuum pump, which is of any desired type, is provided with an adjustable vacuum regulator (not shown) for shutting off the pump when the vacuum in the tank has reached the desired degree, for example, a vacuum of about 20 inches of mercury. From the vacuum tank a pipe 22 connects to a float reservoir 23, placed above the water level of the boiler and the return line 15 has a pressure equalizing connection 24 to the same reservoir 23. From the bottom of the reservoir 23 a pipe 25 leads through the return pipe 16 to the boiler.

Thus, when the system is in operation the pressure in the return line 15 is maintained at a considerably lower limit than the pressure in the boiler 5, though of course the pressure in the boiler 5 may be below atmospheric and the principal requirement is that there be a differential of pressure between the boiler and the return line so as to induce a flow of steam or vapor, as will be understood. The return water from the pipe 15 passes down through pipe 26 but due to the upward bend in pressure connection 24 cannot pass directly into reservoir 23. Water from pipe 26 builds up in pipe 25 which enters the bottom of reservoir 23, and the level gradually builds up until it reaches about the level of the dot and dash line in Fig. 2. Within the reservoir 23 there is a valve fitting 27, having a valve port 28 communicating with the pipe 22 and the vacum tank 21. The inlet 29 to the valve fitting opens into the reservoir 23 at a point above the highest water level therein. A valve 30 for controlling the valve passage 28 is slidable in a guide member 31, connected to the valve fitting or casing, so as to always guide the valve and permit it to open and close the port 28 when raising and lowering. The valve 30 is controlled by a float, which is preferably provided with adjusting means, so as to actuate the valve at desired water levels. In the form shown I provide a bracket 32, surrounding the guide 31 and adjustably held thereon, as by means of a set screw 33. The bracket 32 has an ear 34, which is pivotally connected to the upper end of a link 35. The float lever 36 is pivotally connected to the lower end of the link 35 and at the proper point on the float lever 36 the valve 30 is pivotally connected, as at 37. The float 38 is connected, as shown, at the end of the float lever 36.

For visual inspection the reservoir 23 may be provided with a gage glass 39 and, of course, such other features as drain cocks, etc., may be applied to the reservoir, if desired.

The operation of the device as thus far described is as follows:

The reduced pressure in the return line is maintained by means of the automatically acting vacuum pump and the vapor is drawn through the radiators past the modulating valves. In mild weather the boiler is also under reduced pressure, that is, the system acts strictly as a vapor system. In very severe weather it may happen that some pressure above atmospheric is generated in the boiler. The return water, as stated, passes through the return line 15 and builds up in pipes 25—26 and in the reservoir 23. The pipe line 22 to the vacum tank is open, as shown in Fig. 2, until the return water level builds up to about the level of the dot and dash line shown in Fig. 2, at which time the float will be in the dot and dash line position and the valve 30 will close the port 28 and thus prevent further exhausting from the return line to the vacuum tank. The differential between the boiler and return line pressure will then tend to equalize and when such differential has ben reduced to a sufficient extent the head of water in the reservoir above the water level in the boiler will force water from the reservoir down through pipe 25 and past the check valve 17 and into the boiler. Thus, the return water is returned to the boiler by gravity. When the water level has been reduced in the reservoir 23 the float 38 will sink and thus cause the valve 30 to again open the port 28 and permit resumption of the normal functions of the vacuum tank until such time as the return water again builds up in the reservoir 23, at which time the above described action will be repeated. It will be seen that there is an advantage in having such return water as enters the float reservoir flow in from the bottom and not through a pipe such as the equalizing pipe 24. With a heavy flow of condensate entering the reservoir 23 from the top the float action would be adversely affected. With my system the return water for the most part returns to the boiler through pipes 26, 16 and does not actually flow up into the reservoir. The same water to a large extent descends from and rises up into the reservoir. Furthermore, by providing the check valve 17 boiler water is prevented from reaching the float reservoir and the latter is therefore not likely to become contaminated by scale or sediment and the float action will remain accurate.

It is sometimes desirable to have radiators placed at or below the water level in the boiler, for example, as indicated by the radiator 40 in Fig. 1. The radiator 40 is connected by a branch 41 and modulating valve 42 to the steam or vapor line 6 and is provided with a thermostatic trap 43, the same as the other radiators. From the trap the return water feeds by gravity through pipe 44 and past a check valve 45 opening toward the reservoir 46 and into such reservoir. From reservoir 46 a pipe 47 leads to and is connected to the boiler feed pipe 16. A check valve 48 is located in the pipe 47 and opens toward the boiler. A stop valve 49 may be provided in the pipe 47.

From the top of the reservoir 46 a line 50 leads to the vacuum tank or some reduced pressure line, as the pipe 22. Stop valve 51 may be interposed in the line 50.

The reservoir 46 is further provided with an atmospheric connection 52. In the form shown I provide a substantial opening in the reservoir 46, which is covered by a plate 53 secured thereto, as by means of bolts (not shown). The plate 50 carries a valve fitting 54, passing through an opening and secured therein by means of a lock nut 55. Passage 56 through the fitting is connected as by means of a union to the vacuum pipe 50. The valve fitting opens at 57 into the interior of reservoir 46 above the highest water level therein. A valve 58 is slidably guided in the valve fitting or a guide member connected thereto and serves to control the passage 56 through the valve fitting. A second similar valve fitting 59 is secured in the plate 53, as by means of a nut 60, and the passage 52 thereof opens to the atmosphere, as heretofore noted. A protecting perforated cover cap 61 may surround the atmospheric connection 52, if desired. The valve fitting 59 also opens into the reservoir 46 at 62, that is, above the maximum water level of the reservoir. A valve 63 in all respects similar to the valve 58 controls the passage 52. The two valves are pivotally connected

by means of links 64—64 to a rocker 65, which is pivotally connected at 66 to a supporting bar or bracket 67 carried by a cover plate 53. Thus, when the rocker 65 is rocked one of the valves will be closed and the other opened. The valves are automatically controlled by means of a float and the water level in the reservoir 46.

In the form illustrated the bar 67 extends downwardly and the float fitting 68 is pivotally connected thereto at 69. The float fitting has a float arm 70, carrying at its outer end a float 71. Between the upwardly extending arm 72 of the float fitting 68 and a downwardly extending lug 73 on the rocker 65 is interposed a compression spring, so that the rocker is rocked with a snap action, that is to say, when the float rises from the full line position of Fig. 3 the compression spring 74 is compressed and when the arm 72 passes slightly beyond the center position the spring serves to snap the rocker 65, so as to close the valve 58 and open the valve 63.

The operation of the parts associated with reservoir 46 is as follows:

The reservoir 46 is placed below the water level in the boiler and the return water from the low placed radiators collects in the reservoir 46 until the level rises to about the dot and dash line position shown, at which time the float 71 will have raised and the rocker 65 will be snapped over, so as to close the connection to the vacuum pipe 50 and open the atmospheric connection 52. With atmospheric pressure in the reservoir 46 the return water from such reservoir will be forced into the boiler which is, of course, below atmospheric pressure.

Thus, whether the radiators be placed above or below the water level of the boiler I provide means for returning the condensate to the boiler without the aid of the usual boiler return pump. If the return water can be collected in the overhead reservoir 23 I prefer to feed the water back to the boiler by gravity and in that case the reservoir 46 and parts associated therewith will be unnecessary. On the other hand, the reservoir 46 could be employed for returning condensate from all radiators and if there should be a case where all radiators are below the boiler water level the reservoir 23 and parts associated therewith would be unnecessary.

While the invention has been described in a preferred form it is to be understood that various changes, additions or omissions may be made within the scope of the invention as defined in the appended claims.

I claim:

1. In a vacuum heating system, a boiler, heat radiators connected thereto, a return water line connecting said radiators and boiler, a float reservoir located above the normal water level of said boiler, a single water connection between said return water line and float reservoir and opening into the bottom of said reservoir, a vapor connection between said return water line and the top of said reservoir, vacuum inducing means, a pressure connection from the top of said reservoir to said vacuum inducing means, a float in said reservoir and a valve controlled by said float for closing said pressure connection upon a rise of said float on the water in said reservoir and opening said valve upon a drop of said float in said reservoir, whereby when said pressure connection to said vacuum inducing means is shut off the differential pressure between the boiler and return water line will be reduced and the return water may flow by gravity back into said boiler.

2. In a vacuum system, a boiler, heat radiators connected thereto, a return water line connecting said radiators and said boiler, a check valve in said return water line and opening toward said boiler, a float reservoir above the normal water level of said boiler, a water connection from said return line extending upwardly and into the bottom of said float reservoir, said water connection being connected to said return line at a point between said check valve and radiators, whereby water from said boiler will be prevented from flowing from said boiler to said float reservoir, a vapor connection between said return water line and the upper part of said reservoir, vacuum inducing means, a pressure connection therefrom to the top of said float reservoir, a float in said reservoir, a valve controlled thereby for opening and closing said pressure connection upon a fall and rise of said float upon the water in said reservoir, for the purpose described.

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