

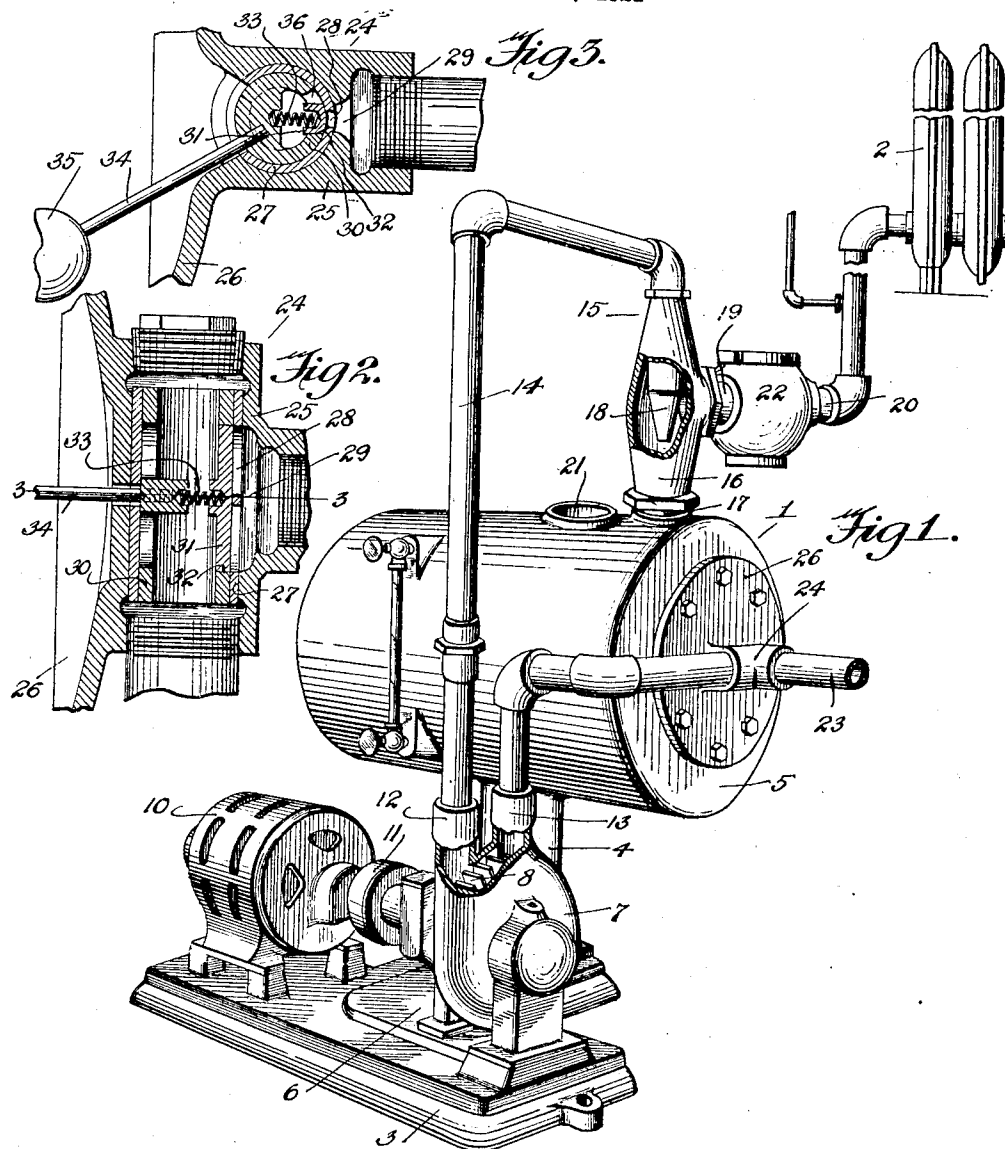
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STEAM HEATING SYSTEM

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STEAM-HEATING SYSTEM.

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To all whom it may concern:

Be it known that HARRY L. BACHMAN, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, has invented certain new and useful Improvements in Steam-Heating Systems, of which the following is a specification.

This invention relates broadly to improvements in steam heating systems and has for its primary object to provide a heating system wherein an improved structure is present for the purpose of effecting the removal of all air and water of condensation from an associated steam heating system and to return the water of condensation back to the boiler and the air to the atmosphere by automatically maintaining a vacuum on the system.

Another object of the invention resides in the provision of mechanism of the above character wherein is located a centrifugal pump, or an equivalent pumping member, having a dual discharge, with which are connected independent pipes, one of said pipes leading to an injector which normally operates to create a vacuum in the heating system and to draw the water of condensation and air into the reservoir of the apparatus, and to provide an independent boiler return pipe in conjunction with the other discharge outlet of the pump, which piping leads to an associated boiler and is provided in its length with an automatically operable valve, the latter being controlled by the level of the liquid within the reservoir, in order that when a certain amount of water accumulates within said reservoir by the action of the apparatus, said valve will be opened to permit of the forcing of the water or liquid from the reservoir to the boiler and thence back into the heating system proper, this operation continuing until the water level in the reservoir recedes to a desired level, whereupon the valve is closed to again permit of the normal operation of the system.

A further object of the invention resides in the provision of an improved valve construction in the boiler return pipe, said construction being of the balanced variety and includes telescopic members having ports formed therein, relative movement of said members being effected through the instrumentality of a float construction situated within the reservoir and operative upon the

rise and fall of the liquid level in said reservoir to effect relative movement between said members so as to bring the ports thereof into or out of registration, whereby the passage of fluid through the valve construction as a whole may be automatically and readily governed.

With these and other objects in view, as will appear as the description proceeds, the invention accordingly consists in the novel features of construction, combinations of elements and arrangements of parts, hereinafter to be fully described and pointed out in the appended claims.

In the accompanying drawing, forming a part of this specification, and in which similar characters of reference denote like and corresponding parts throughout the several views thereof:

Figure 1 is a perspective view disclosing the improved apparatus embodied in the heating system,

Figure 2 is a horizontal sectional view taken through the valve construction provided in the boiler return pipe line, and

Figure 3 is a vertical sectional view taken along the line 3—3 of Figure 2.

Referring more particularly to the details of the invention, the numeral 1 designates the improved vacuum producing unit or apparatus comprising the present invention. This apparatus is designed to be employed in connection with a steam heating system 2 in whatever capacity the latter may be placed, and by its use said apparatus will serve to withdraw air and water of condensation from the pipes and appliances provided in the system 2, in order that the free circulation of steam through the system may be provided and impediments in the path of said circulation removed. To this end, the apparatus comprises a base 3 upon which is mounted a hollow pedestal 4, the latter being disposed to support a horizontally situated tank or reservoir 5. The upper surface of the base is provided with a pad 6, upon which is suitably mounted the base of a centrifugal pump or its equivalent 7, the said pump including the usual rotor 8 whose vanes are so disposed that the same will normally tend to force the fluid in engagement therewith toward the outer circumferential part of the pump. In this instance the pump is driven by means of an electric motor 10, which is mounted upon the

base 3 and has its armature shaft united by means of a coupling 11 with the driving shaft for the pump 7, whereby when said motor is excited the operation of the pump will be positively effected. This invention does not aim to cover broadly the use of an electrically driven centrifugal pump in a system of this character, such a combination has been disclosed in the patent to Young 1,287,169, December 10, 1918, and upon which structure the present invention is believed to constitute an improvement. As previously stated, the pedestal 4 is of hollow formation and communicates with the interior of the reservoir 5, the lower end of said pedestal being in communication with a conduit provided in the base 3, which conduit leads directly to the intake of the pump 7. By this construction a conduit will be provided between the reservoir and the pump 7, which will supply the latter with liquid directly from said reservoir and will serve to eliminate the evils of expansion or contraction commonly found in the ordinary forms of piping by avoiding misalignment of pump or motor shafting.

As shown, the casing of the pump 7 is formed to comprise a pair of spaced discharge outlets 12 and 13, from which liquid is ejected from the pump. The outlet 12 is connected with one end of an injector pipe line 14, the opposite end of said pipe line being terminated within an injector 15. The injector 15 is of standard construction and consists of a casing 16 which has its lower end threaded as at 17 into an opening provided in the upper portion of the reservoir 5, and further, the interior of the casing 16 is provided with a downwardly directed nozzle 18 which operates to direct a fluid stream delivered from the pump 7 with considerable velocity into the interior of the pump 7, completing the normal cycle of circulation of the reservoir liquid.

The casing 16 is provided at a point intermediate of its length with a lateral branch 19, which is situated immediately above the discharge end of the nozzle 18. This branch is connected with one end of the return piping 20 of the steam heating system 2, whereby when liquid is being forcibly discharged from the nozzle 18 a vacuum will be produced substantially in the system 2, which will serve to force the water of condensation and air through the piping 20 and thence into the reservoir 5, the water of condensation being confined within said reservoir while the air is permitted to separate and pass off from the system by way of the vent 21 provided in the upper part of the reservoir 5. By this construction it will be manifest that when the injector 15 is in active operation a vacuum will be maintained on the heating system, which will effect the removal of undesired

fluids or condensate from said system and to thereby permit of the free circulation of the heating medium, which in this instance is steam. Preferably, the piping 20 is equipped with an automatically operable check valve 22 which serves to maintain the vacuum in the system 2 when the injector 15 is not in active operation.

In order to maintain the liquid within the reservoir 5 within desired limits and to return excess liquid to an associated boiler, the discharge outlet 13 connected with one end of a boiler return line 23. This line is provided intermediately of its length with a valve structure 24 which is opened or closed in accordance with the liquid level within said reservoir, the arrangement of parts being such that when the reservoir is filled to a predetermined level with water or condensation derived from the system 2, the said valve structure 24 will be opened, thus permitting water from the reservoir 5 to be pumped through the line 23 back to the boiler of the steam heating system and to enable this water to again be utilized in the steam heating system. When a sufficient volume of the water has been pumped back into the boiler, the structure 24 is automatically closed, thus causing the water in the tank or reservoir to be forced through the injector 15 for vacuum creating purposes.

In the specific form of the present invention under discussion, the valve structure 24 consists of a chamber 25 which is provided in one of the removable end plates 26 forming a part of the reservoir 5, said chamber constituting a part or continuation of the return line 23. Located within the chamber 25 is a stationary sleeve 27 in which is provided an elongated opening or port 28, the latter being in communication with the discharge outlet 29 of said chamber. Normally arranged to close the port 28 and consequently the outlet 29 is a tubular valve member 30, which is rotatably received within the stationary sleeve 27. The member 30 in this instance is provided with a closure plate 31 which is mounted within a slot 32 provided in the wall of said member, and a spring 33 is situated to engage with the plate 31 so as to force the latter into engagement with the inner wall of the sleeve 27 so as to cover the port 28 formed therein. To operate the valve member the latter is connected with the inner end of a float stem 34, which projects into the reservoir 5 and has its outer end connected with an air tight float 35, the arrangement being such that the rise and fall of the water within the reservoir will rotate the valve member 30 so that the plate 31 will be brought into or out of registration with the port 28 in the sleeve 27. It will be observed that the slot 32 in which the plate 31 is mounted is extended so as to pro-

vide a discharge port 36 in said valve member. This port 36 is in communication with the hollow interior of the valve member 30 and consequently in open communication
5 with the chamber 25 and the inlet end of the boiler return line 23. However, it will be manifest that when the water rises within the reservoir, the valve member 30 will be rotated by the float and stem construction
10 so that the port 36 thereof will register with the port 28, and thereby permitting of the flow of liquid through the valve structure and into the discharge end of the boiler return line 23. When a suitable quantity of
15 liquid has been discharged from the reservoir by way of the line 23 into the associated boiler, the valve structure will then automatically operate to close the line 23, causing the active operation of the injector 15 which had been previously rendered more or less ineffective by the circulation of water through the line 23.

From the foregoing description, taken in conjunction with the accompanying drawing, it will be apparent that the present invention provides an apparatus which will automatically and effectively operate without inconvenience or complication to maintain the conduits of a steam heating system free from the presence of superfluous and circulation obstructing air and accumulated moisture or condensate. Any suitable mechanism may be employed for starting or stopping the motor 10, however, in practice
35 it has been found desirable to automatically control the operation of this motor by providing a switch which is operated by the vacuum within the system 2, the arrangement being such that when the vacuum
40 falls to a predetermined number of inches, the motor will be automatically started to operate the pump 7 and conversely when the vacuum reaches its maximum point, the switch structure will automatically serve to
45 arrest operation on the part of the motor. By the inclusion of this structure the apparatus is rendered entirely automatic in operation, hence its cost of up-keep is maintained at a minimum.

50 From the foregoing description it is believed that the operation, construction and

advantages of the invention will be readily understood by those versed in the art, and therefore a more extended explanation has been accordingly omitted.

What is claimed is:

1. In a heating system, a vacuum producing unit comprising a base, a reservoir, a hollow pedestal mounted upon said base and operative to support said reservoir, said pedestal being in communication with the interior of said reservoir, a motor driven pump positioned upon said base, a conduit between the reservoir and pump, the inlet of said pump being in communication with
65 said conduit, a return pipe leading from the discharge of said pump back to said reservoir, an injector in said pipe, a return pipe from a steam heating system in communication with said pipe at a point above said
70 injector, a boiler return pipe in communication with said pump, and a valve structure automatically operative in accordance with the liquid level within said reservoir for controlling the flow of the liquid through said
75 boiler return pipe.

2. In a heating system, a vacuum producing unit comprising a base, a horizontally disposed reservoir supported from said base, a motor driven pump, a conduit between
80 said reservoir and said pump, a pair of discharge outlet connections carried by said pump, a reservoir return pipe leading from one of said discharge conduits, an injector formed by the upper portion of said reservoir and communicating with the discharge
85 end of said pipe, a steam pipe from a steam heating system having a return pipe disposed in communication with said reservoir, said return pipe entering said injector at a
90 position above the nozzle thereof, a check valve in the return pipe of said heating system, a boiler return pipe communicating with the other of the discharge connections of said pump, and a valve structure located
95 in said boiler return pipe and operative in accordance with the liquid level within said reservoir to control the passage of liquid therethrough.

In testimony whereof I affix my signature.

HARRY L. BACHMAN.