J. B. MORGAN.

FLUSHING AND HEATING SYSTEM.

APPLICATION FILED OCT. 8, 1909.

976,484.

Patented Nov. 22, 1910.

2 SHEETS—SHEET 1.

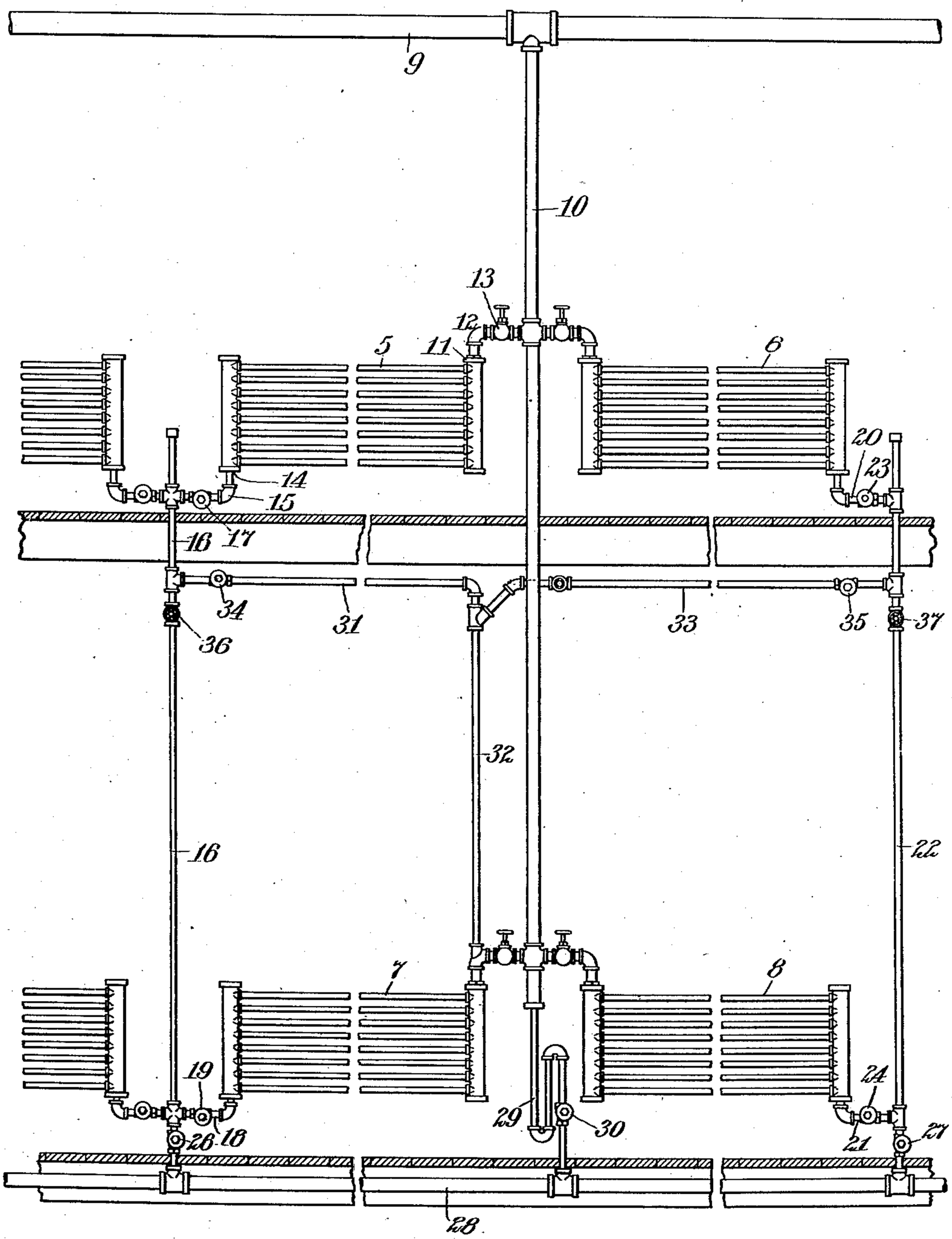

Fig. 1.

Witnesses:

Franklin E. Low.

Sydney O. Taft.

Inventor:

John B. Morgan,

by his attorney

Charles J. Gooding.

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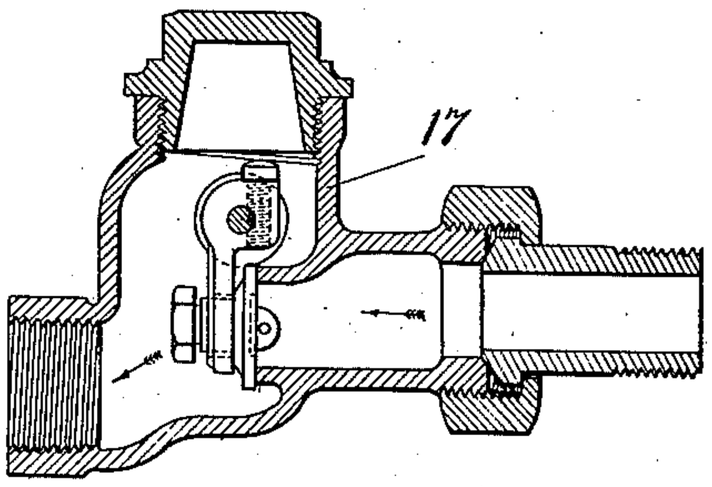

Fig. 3

Fig. 2.

Witnesses:

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UNITED STATES PATENT OFFICE.

JOHN B. MORGAN, OF ROCHESTER, NEW YORK.

FLUSHING AND HEATING SYSTEM.

976,484. Specification of Letters Patent. Patented Nov. 22, 1910.

Application filed October 8, 1909. Serial No. 521,699.

To all whom it may concern:

Be it known that I, JOHN B. MORGAN, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented new and useful Improvements in Flushing and Heating Systems, of which the following is a specification.

This invention relates to an improved vacuum steam heating and flushing system in which low pressure exhaust steam supply comes from an overhead main supply pipe and high pressure live steam for flushing the system comes from the boiler.

One object of my invention is to provide in a system of the character set forth means whereby the system may be connected at will to a source of live steam under pressure and to provide a spring-actuated valve or a series of spring-actuated valves yielding to a steam pressure greater than the tension of the spring that actuates said valve, permitting the whole system to be flushed out to remove the oil, scale and oil deposits accruing from the cylinder oil of the engine, or corrosion and other foreign substances from the pipes, radiators and valves, without it being necessary to incur the usual maintenance expense of having employees go constantly into different apartments or offices of a building to remove the dirt or scale from the pipes, radiators and valves, all as will be hereinafter more fully set forth in the specific description of my improved vacuum steam heating and flushing system.

Sometimes it is desirable to have in one of the radiators a lower degree of heat than would be supplied by steam and it is a further object of my invention to provide means whereby the condensation of the steam in a primary radiator may be caused to pass through a secondary radiator and thence to the return riser and suction pipe so that the secondary radiator may be heated by hot water instead of steam, this object being attained by providing in addition to the supply pipe connected to the valve controlled inlets of the primary and secondary radiators a pipe forming a communication between the outlet of the primary radiator and the inlet of the secondary radiator, a valve controlling such communication, and a second valve in the return riser between the outlets of the primary and secondary radiators. When the latter valve is closed, the former one opened, and the steam inlet valve of the secondary radiator is closed, the condensation from the primary radiator passes into the secondary radiator and thence into the return riser, while if the second valve be opened, the first valve closed, and the steam inlet valve of the secondary radiator is opened, both radiators may receive their supply of steam from the supply pipe and will discharge their condensation into the return riser from whence it passes into the suction pipe.

My invention consists in the combination and arrangement of parts set forth in the following specification and particularly pointed out in the claims thereof.

Referring to the drawings: Figure 1 is a sectional elevation taken through two floors of a building illustrating my improved steam heating system, certain parts being broken away to save space in the drawings. Fig. 2 is an end elevation of a vacuum pump, regulator and connections to said steam heating system. Fig. 3 is a sectional view of the regulating valve.

In the drawings, 5, 6, 7 and 8 are radiators of suitable construction, either in the form of tubes or sections and in this connection it will be understood that the word "radiator" is used throughout the specification and in the claims in the sense of any fixture which will contain steam and diffuse heat by reason thereof. The radiators 5 and 7 are in series, one over the other, and although only two are shown in each of the series, the number of radiators may be indefinitely extended according to the number of floors in the building and this is true also of the radiators 6 and 8 and the series to which they belong.

The steam supply, as shown in Fig. 1, enters the system through an overhead steam supply pipe 9, although I do not limit myself to this specific construction. From this pipe a steam supply riser 10 extends downwardly and is connected to the inlet 11 of the radiator 5 by connections 12, a suitable valve 13 adapted to be operated by hand being interposed in these connections 12, for the purpose of admitting or shutting off the steam from the radiator 5. The steam is also adapted to be supplied to or shut off from the radiators 6, 7 and 8 in a similar manner.

Steam passes into the radiator 5 which is connected at its outlet 14 by connections 15 to the return riser 16 and interposed in these connections 15 is a spring-actuated regu-

lating valve 17 of any suitable construction, but preferably of the construction shown in Fig. 3 and illustrated and described in United States Letters Patent, No. 940,182, dated November 16, 1909.

The radiator 7 is connected to the return riser 16 by suitable connections 18 in which is interposed another spring-actuated regulating valve 19 like the valve 17. The radiators 6 and 8 are connected by suitable connections 20 and 21, respectively, to the return riser 22 and in said connections are inserted spring-actuated regulating valves 23 and 24, respectively, said valves being the same as the valves 17 and 19. Beneath the lowermost radiators 7 and 8, near the bottom of the return risers 16 and 22, are placed in said return risers the controller valves 26 and 27, respectively.

The return risers 16 and 22 are connected to the main suction pipe 28 and the drip to the steam supply riser 10 is also connected to said suction pipe, preferably by a water seal shown by a pipe 29 formed in a double U or return bend, although I do not limit myself to this specific construction. The form shown constitutes a trap or seal into which the condensed steam enters from the steam supply, and in this pipe 29 the spring-actuated regulating valve 30 is introduced. The object of this seal and valve is to prevent sudden and heavy discharges of condensed steam into the vacuum pipe 28. The valve 30 prevents any such sudden delivery of condensed water into the vacuum pipe and thence into the suction pump, which would occur without such a valve, and when water is thus delivered in large quantities suddenly to the suction pipe it interferes with the proper operation of the vacuum pump and hence necessarily with the proper circulation of the steam throughout the system. By using the spring-actuated regulating valve 30 in this particular location, however, such interference with the proper operation of the suction pump and of the vacuum system throughout, is eliminated.

The return risers 16 and 22 are connected to the inlet of the radiator 7 by a pipe 32 and branch pipes 31 and 33. Spring-actuated regulating valves 34 and 35 are provided in pipes 31 and 33, respectively, and suitable valves 36 and 37 adapted to be operated by hand are interposed in the return risers 16 and 22, respectively, all for a purpose hereinafter set forth.

A vacuum of preferably ten inches is maintained in the suction pipe 28 by a suitable vacuum pump 38, receiving its steam supply through a steam supply pipe 40 having in its length a manually operated valve 41 by which the steam supply to said pump may be shut off. The operation of this pump is automatically governed by a usual diaphragm operator 47 controlling a valve 48 in the pipe 40, said regulator being connected by a pipe 49 to the suction pipe 28 and operating in the usual and well known manner to automatically govern the pump 38 so as to maintain a substantially constant vacuum in the suction pipe 28. Exhaust steam is supplied to the pipe 9 through the pipe 43^2 and pipe 43 and low pressure steam may be supplied to said pipe 9 through the in-take low pressure pipe 9′. Live steam from the boiler may be admitted to the system through the high pressure pipe 43′ in which is located a valve 39. A valve 44 is supplied in the suction pipe 28. A waste or flush-out pipe 46 leads out of said suction pipe 28 and is supplied with a valve 45, so that by closing the valve 44, opening the valve 39 and opening the valve 45 the pipes of this system may be filled with a pressure of live steam, and the cylinder oil, rust, dirt and any other impediments to circulation which are constantly forming in all portions of the steam supply system may be blown out through the waste or flush-out pipe 46 by the live steam pressure, as will be more fully explained hereinafter.

The general operation of my improved vacuum steam heating system is as follows: Assuming the pump 38 to produce in the suction pipe 28 a vacuum of about ten inches, the controller valves 26 and 27 are so regulated as to the tension of their respective springs that the vacuum above them in the return risers 16 and 22 will be approximately two inches. The steam passes from the main supply pipe 9 into the steam supply riser 10 and thence downward through the connections to the different radiators 5, 6, 7 and 8. When the steam condenses in a radiator, for instance in the radiator 7, and a certain amount of water gathers in said radiator, it will pass out of said radiator opening the spring-actuated valve 19 against the action of its spring by the difference in pressure on the two sides of it and enter the return riser 16.

When the water enters the return riser 16 approximately at a temperature of 212°, it will become partially vaporized, due to a lower pressure, and after condensing will pass with the unvaporized water at a lower temperature into the suction pipe 28 and outwardly through the pump 38. The same action occurs in relation to the other radiators 5, 6 and 8 through their respective connections and spring-actuated valves to the return risers. The water of condensation will also pass from the steam riser 10 through the double U loop or seal 29 and its controller valve 30 into the suction pipe. Thus the valves 26, 27 and 30 control the delivery of the condensed water to the suction pipe and deliver it to said suction pipe at a lower temperature than would be the case if the water which condenses in the

radiators and in the steam supply riser were to be delivered directly from said risers to the suction pipe 28, with the result that as this water of condensation is delivered to the suction pipe at a sufficiently low temperature to prevent the unsealing of the valves in the suction pump, said suction pump will operate under normal conditions without the injection into said suction pipe of cold water in excessive quantities for the purpose of creating an artificial vacuum and reducing the temperature of the water in the suction pipe before it arrives at the suction pump.

If it is desired to have a lower degree of heat in the radiator 7 than would be supplied by steam, the valves 36 and 37 may be closed and the condensation of the steam from the radiators 5 and 6 will then pass through the pipes 31 and 33 downwardly through the pipe 32 into the radiator 7, and thus said radiator will be heated by hot water instead of by steam.

When it is desired to blow out and clean out the entire system, the hand valve 39 is opened, admitting live steam pressure, the valve 44 is closed and the valve 45 is next opened, thus cutting off the suction pump from the suction pipe and opening said suction pipe 28 into the waste or flush-out pipe 46. Thus all the spring-actuated valves are automatically opened to the full capacity of the respective pipes in which they are located by a steam pressure greater than the resistance of the springs of said spring-actuated valves, thus forcing all impediments to circulation from said pipes and radiators out through said different valve connections from the radiators to the risers and through the spring-actuated regulating valves 17, 19, 23 and 24 and through the controller valves 26 and 27, all of said spring regulating valves and controller valves having been blown wide open against the tension of the springs thereon, and emptying all of said dirt and foreign matter into the suction pipe from whence it is discharged into the waste pipe 46. When the system has thus been thoroughly cleaned out, the valves 39 and 45 are closed, the valve 44 is opened, and the apparatus is then in condition for the vacuum heating system to operate as before. It will be seen that if in this flushing out operation the valves 36 and 37 are closed, the waste, dirt, water, etc. will pass through the pipes 31, 33 and 32 and through the radiator 7 and outwardly therefrom in the manner hereinbefore described, and under these conditions the pipes 31, 33 and 32 will constitute flush-out pipes. Also it will be noted that whether the valves 36 and 37 are closed or opened, this flushing out or cleaning operation will take place without its being necessary for any one to change any of the valves in the system other than the valves 39 and 44 and 45, so that it will not be necessary for the engineer or workman to go to different apartments or offices preliminary to and subsequently to the flushing-out operation in order to change the valves therein to blow off the system. Said controller also acts as an equalizing valve in distributing the pressure of steam evenly over the building when the system is being blown off and the dirt and pipe scales being blown therefrom.

Having thus described my invention, what I claim and desire by Letters Patent to secure is:

1. A vacuum steam heating system having, in combination, a steam supply pipe, a return pipe for the air and water of condensation, a radiator having an inlet communicating with said supply pipe and an outlet communicating with said return pipe, a flush-out pipe communicating with said return pipe, a valve controlling the communication between said return pipe and said flush-out pipe, means connected to said return pipe to produce a vacuum therein, a valve controlling the communication between said return pipe and said vacuum creating means, means for controlling the communication between said return pipe and said radiator and acting to automatically control the difference of pressure therebetween, a pressure pipe communicating with said radiator, and a valve controlling the communication between said pressure pipe and said radiator.

2. A steam heating system having, in combination, a steam supply pipe, a return pipe for the air and water of condensation, a primary radiator communicating with said supply pipe, a secondary radiator communicating with said supply pipe, a return riser communicating with the outlets of both of said radiators and with said return pipe, a valve in said return riser between said outlets, a valve interposed in the connection between said supply pipe and said secondary radiator, a pipe forming a communication between the outlet of said primary radiator and the inlet of said secondary radiator, a valve controlling such communication between the outlet of said primary radiator and the inlet of said secondary radiator, and a regulating valve acting to automatically control the flow from the outlet of said secondary radiator to said return pipe.

3. A vacuum steam heating system having, in combination, a plurality of radiators, a steam supply pipe connected to the inlet orifice of each of said radiators, a main suction return pipe, means to create a vacuum in said suction pipe, a return riser connected to said suction pipe and to the outlet of each of said radiators, a spring-actuated regulating valve interposed between each of said radiators and said return riser and a spring-actuated regulating valve located in said re-

turn riser between said radiator and said suction pipe, an intake pressure pipe opening into said steam supply pipe, a valve therefor, a flush-out pipe connected to said heating system at the lower end thereof, and a hand valve adapted to close said flush-out pipe located beneath said main suction return pipe.

4. A vacuum steam heating system having, in combination, two radiators, a main steam supply pipe connected to the inlet of each of said radiators, a suction pipe, means for producing a vacuum in said suction pipe, a return riser connected to said suction pipe, connections from said return riser to the outlet of each of said radiators, a spring-actuated regulating valve interposed in each of said connections, a spring-actuated regulating valve in said return riser between said radiators and said suction pipe, an intake pressure pipe entering the main steam supply pipe a valve therefor, a flush-out pipe connected to and leading out of said heating system, and a valve for said flush-out pipe, substantially as described for the purpose specified.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN B. MORGAN.

Witnesses:
JOSEPHUS ALBEE,
A. FRANK WARREN.