

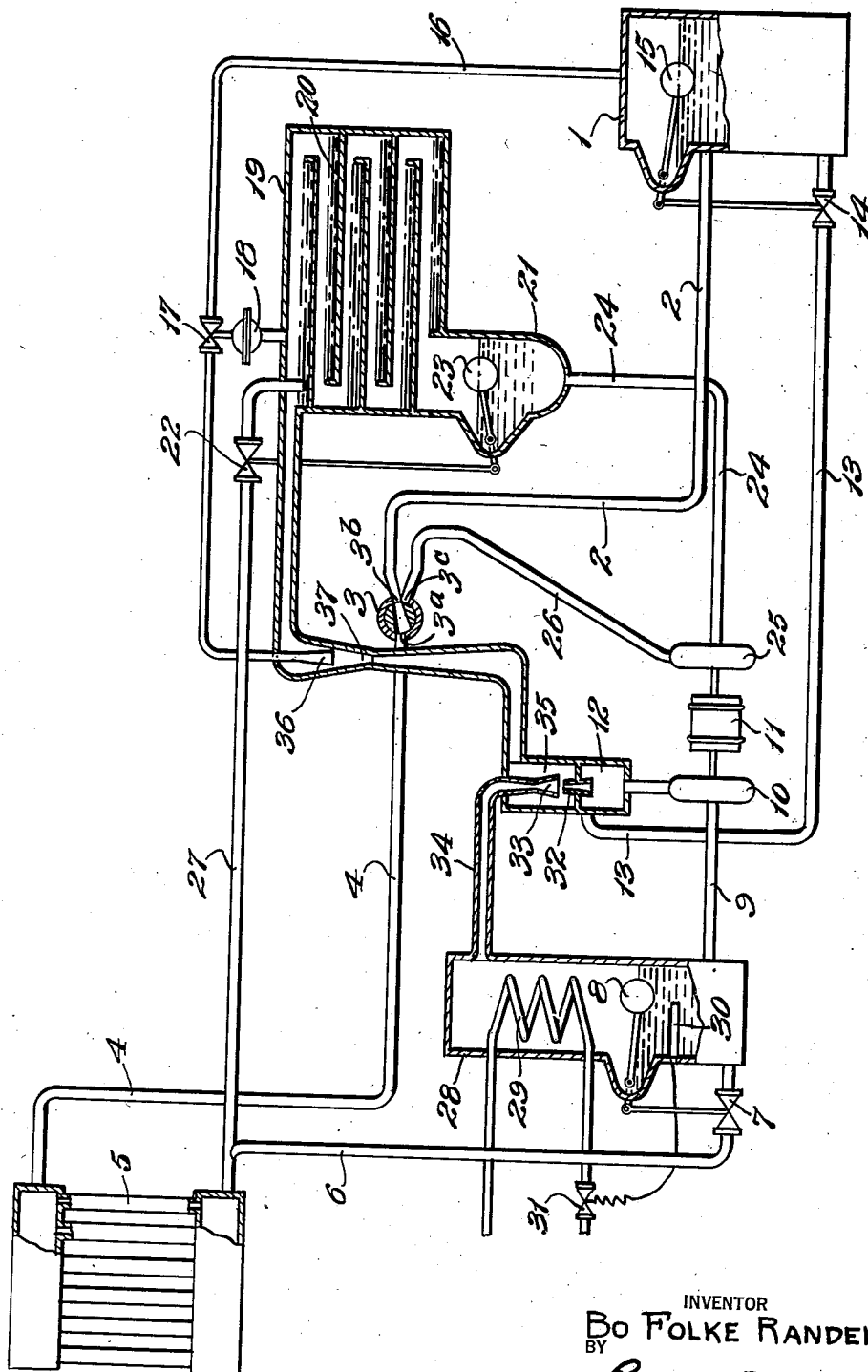
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B. F. RANDEL

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HEATING AND COOLING APPARATUS

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INVENTOR
Bo FOLKE RANDEL
BY
Robert A. Lavender
ATTORNEY

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HEATING AND COOLING APPARATUS

Bo Folke Randel, San Diego, Calif.

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This invention relates to heating and cooling and the object is to devise a method of and an arrangement of apparatus which may be utilized for heating and cooling by the manipulation of valves, either manually or automatically.

The several different parts are standard devices known and used in the arts, and my invention is a combined arrangement of such known parts in a novel manner to carry out a desired object. Such well known parts are a conventional heating boiler, radiators, steam ejector, condenser and vacuum producer, miscellaneous floats and thermostatic valves, etc. Any of the different parts may be constructed as shown in the accompanying drawing or they may be of any conventional form, and I include any such forms in my arrangement.

The single figure of the accompanying drawing is a diagrammatic view of a combined heating and cooling system constructed and operating in accordance with the invention.

To use the combined device for either heating or cooling will require the manipulation of one part only, the mixing valve 3. This mixing valve 3, which I will describe first, is illustrated as a three-way cock so arranged that the discharge end 3a is open at all positions while the inlet end is open to 3b or 3c or partly to both. Or, in other words, by turning cock 3, 3b may open to 3a or 3c may be open to 3a, and the cock may be manipulated so as to arrange certain proportions of 3b and 3c to open to 3a. If, therefore, hot water passes through 3b and cold water through 3c, we may have all hot or all cold through 3a, or a mixture of both to give any desired temperature through 3a. The valve may be manually or automatically operated. It may be operated by outside temperature so as to furnish a desired temperature on the water passing to a radiator to either heat or cool as required.

Other arrangement of mixing valves may be made, as for instance two ordinary valves controlled manually or automatically, either singly or in conjunction, so that one will close while the other opens. Any such arrangement is included in my invention.

The mixing device has been described first for the reason that by manipulation of this device the entire system will operate either as a heating device or as a cooling device. In the position of this mixing valve shown on drawing, the device will operate as a heating system, and I will describe the system first as such.

Boiler 1 generates hot water and steam which former passes through pipe 2, opening 3b in mix-

ing valve 3 and 3a in same valve, through pipe 4 into radiator or heating element 5. This radiator may be an individual radiator or several radiators or so-called unit heaters or any device which transfers heat to a space, substance or an object.

The power which forces this hot water from the boiler to the radiator originates in pump 10 driven by motor 11. It is seen that pump 10 will pull water from condenser-storage tank 28 through pipe 9 and deliver to high pressure chamber 12. From this high pressure chamber, the water will flow in two directions, through nozzles 32 and 33 and pipe 34 back to condenser 28, and also through pipe 13, valve 14 to boiler 1 and thence as before described to radiator 5.

The pulling of water from condenser 28, some of which will discharge into the boiler will lower float 8 in this condenser and open valve 7 permitting a flow from radiator through pipe 6. And the lowering of the water level in boiler 1 by pulling water through 2 will also keep valve 14 open. This valve is normally open at all times, closing only in case the water level in boiler should rise over a desired point. In starting the arrangement, boiler 1 would be filled so high that valve 14 would be open.

It is seen that pump 25 delivering water from storage vessel 21, through pipes 24 and 26 will not be active, merely turning around in its casing. Valve 22, made to be closed by an upward motion of float 23, is closed when water coming from radiator 5 through pipe 27 has accumulated in storage vessel 21.

As stated before, boiler 1 generates steam which will rise in pipe 16, bypass valve 17 (open in up-diaphragm position) which is operated by diaphragm 18 actuated by pressure or vacuum in flash chamber 19. The steam continues through steam ejectors 36 and 37, causing a high vacuum in flash chamber 19. As no water enters into this flash chamber during heating operation, valve 22 being closed, a high vacuum will be produced and valve 17 is adjusted to close at a definite high vacuum, thus throttling or completely stopping inflow of steam through 16.

Nozzles 32 and 33 in vacuum producing chamber 35 will allow for an initial low pressure, these nozzles acting as jet condensers.

It is thus seen that when mixing valve 3 is in position as shown, the main flow will occur from boiler 1 to radiator 5, through condenser 28, pump 10, high pressure chamber 12, pipe 13 and back to boiler. The system in this condition acts as an ordinary hot water heating system.

When the mixing valve 3 is reversed so as to have a passage from 3c to 3a instead of from 3b to 3a, pump 25 comes into action, pulling water from storage vessel 21 through pipes 24, 26 and 4 to radiator 5. Float 23 will open valve 22 to permit flow of water from radiator through 27 and into flash chamber 19, where it drops over trays 20 down to storage vessel 21. As pipe 2 is closed at valve 3, no hot water will be pulled out of boiler, which will cause an accumulation of water in condenser 28, where valve 7 is closed by float 8.

The combined action will cause an increase of vapor pressure in 19 and then an opening of steam valve 17. The action in steam ejector 37 will lower the pressure in 19 and cause evaporation of the water with absorption of heat. The water will be lowered in temperature and the water circulated by pump 25 will be cold water instead of hot water, which thus will cause cooling by radiator 5.

The steam passing through ejector 37, with the water vapors from 19, will be condensed by jet in chamber 35. When the temperature of the water in condenser 28 rises above a predetermined point, valve 31 controlled by thermostat 30, permits water from an outside source to pass through coil 29 in condenser 28 to absorb the heat in this steam and vapor.

It is thus seen that in this condition, the system acts as a cooling system but between these two extreme conditions, any desired condition may be obtained by the manipulation of mixing valve 3. If this valve is actuated by the outside temperature, it will be possible to obtain just the proper temperature on the water in radiator 5 as will maintain an even room temperature. Both hot and cold water will flow in their respective pipes 2 and 26 to be mixed in correct proportions in valve 3.

I have mentioned water as medium as a means of illustration. However, any other medium may be used, as hydrocarbon liquids or other liquids and I include the use of every and all, either pure or solutions or mixtures in my invention.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. A system of heating and cooling consisting of three interconnected circuits as follows: a first circuit for purposes of heating including a boiler with liquid heating medium, liquid mixing means and communication means between said boiler and said mixing means, a radiator and communication means between said mixing means and said radiator, circulating pump means and communication means between said radiator and said pump means and communication means between said pump means and said boiler; a second circuit for purposes of cooling including a high vacuum chamber in which liquid cooling medium of similar nature to said liquid heating medium is partially vaporized absorbing heat from the balance of the liquid cooling medium, circulating pump means and communication means between said vacuum chamber and said pump means, said second circuit also including the said mixing means and communication means between said pump means and said mixing means, the said radiator and said communication means between said mixing means and said radiator and communication means between

said radiator and said high vacuum chamber; and a third circuit for purposes of creating a vacuum, including the said boiler in which the liquid heating means is partially vaporized, a vapor ejector in connection with the said high vacuum chamber and vapor communication means between said boiler and said vapor ejector, the vapor passing through said ejector creating the high vacuum in said high vacuum chamber, a low vacuum liquid condenser and communication means between said vapor ejector and said condenser, cooling means in connection with said condenser and communication means between said condenser and the said boiler to return condensate back to same, the said mixing means being operable to selectively control both of said first and second circuits to obtain the desired degree of heating and cooling.

2. In a system for heating and cooling the combination of a temperature controlling element, a boiler for supplying said temperature controlling element with a heating fluid, an evaporator for supplying said temperature controlling element with a cooling fluid; an injector communicating with said boiler for reducing the pressure in said evaporator; a valve controlled by the pressure in said evaporator for controlling communication between said boiler and said injector; and a valve mechanism for establishing communication between said temperature controlling element and said boiler, and for interrupting communication between said temperature controlling element and said evaporator when the system is employed for heating purposes, and for establishing communication between said temperature controlling element and said evaporator and for interrupting communication between said temperature controlling element and boiler, when the system is employed for cooling purposes.

3. In a system for heating and cooling the combination of a temperature controlling element, a boiler for supplying said temperature controlling element with a heating fluid, and an evaporator for supplying said temperature controlling element with a cooling fluid; a valve automatically controlled by the liquid level in said evaporator for controlling communication between said temperature controlling element and said evaporator; and a single two way valve for establishing communication between said temperature controlling element and said boiler, and for interrupting communication between said temperature controlling element and said evaporator when the system is employed for heating purposes, and for establishing communication between said temperature controlling element and said evaporator and for interrupting communication between said temperature controlling element and boiler, when the system is employed for cooling purposes.

4. In a system for heating and cooling the combination of a temperature controlling element, a boiler for supplying said temperature controlling element with a heating fluid, and an evaporator for supplying said temperature controlling element with a cooling fluid; a valve mechanism for establishing communication between said temperature controlling element and said boiler, and for interrupting communication between said temperature controlling element and said evaporator when the system is employed for heating purposes, and for establishing communication between said temperature controlling

ling element and said evaporator and for interrupting communication between said temperature controlling element and boiler, when the system is employed for cooling purposes; an injector communicably connected with said boiler for reducing the pressure within said evaporator

to accelerate the rate of temperature reduction of said cooling fluid; a condenser for condensing the steam from said injector; and a second injector for increasing the pressure within said condenser.

BO FOLKE RANDEL.