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HEATING OR COOLING SYSTEM

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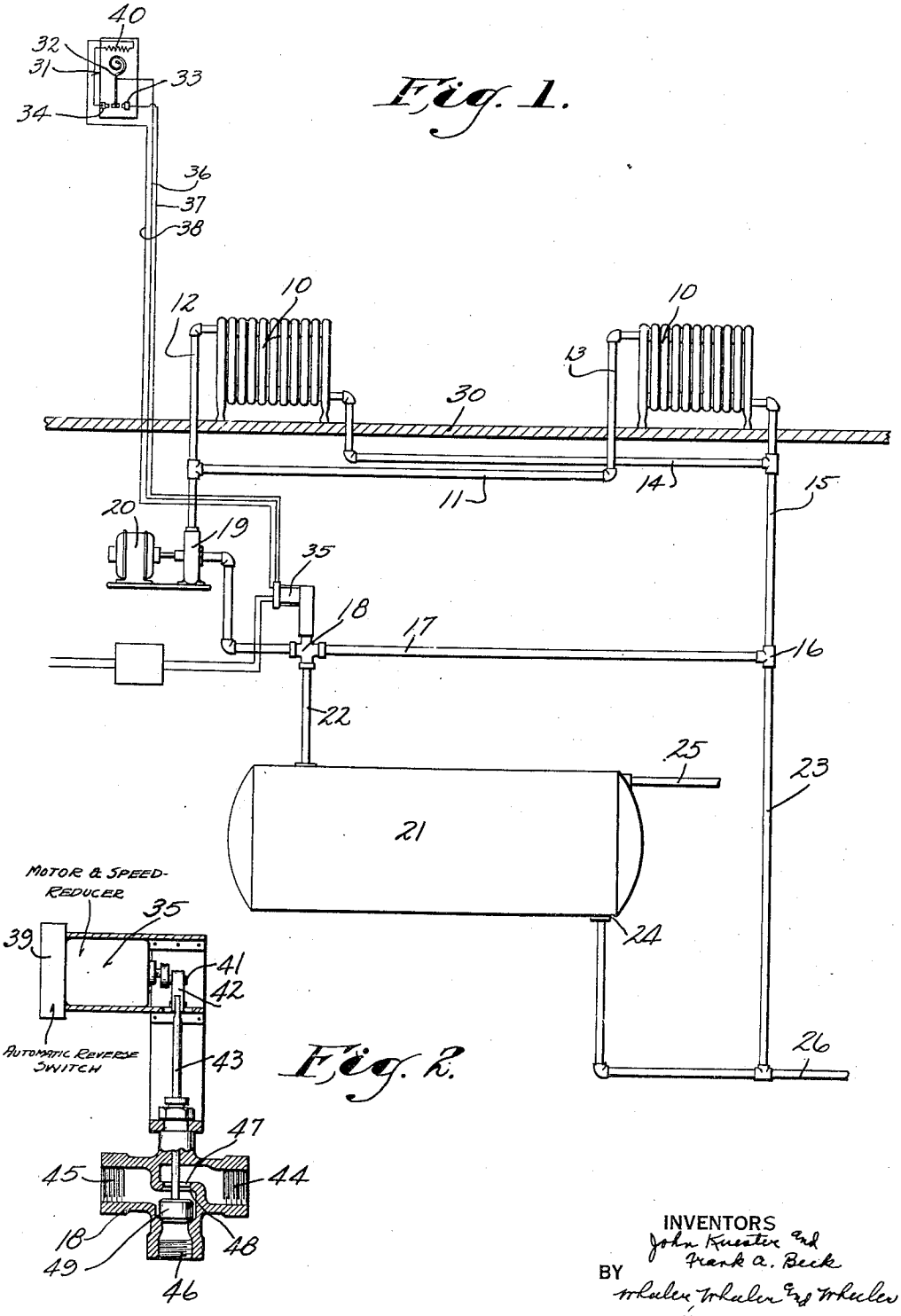



Fig. 1.




Fig. 2.

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## HEATING OR COOLING SYSTEM

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5 Claims. (Cl. 237—2)

Our invention relates to improvements in heating or cooling processes and systems.

While our invention is applicable to both heating and cooling systems, our specification will be directed to a heating system in which a radiating system is used in combination with a source of heat, and our invention pertains primarily to the connections between the source of heat and the radiation system and the control of passage of heat from the source to the radiation system. It will be understood that hereinafter wherever heating or heating means is mentioned, we refer to the use of either heating or refrigerating processes or means.

The object of our invention is to provide a heating system in which heat disseminating means such as a radiator system is separated from a source of high heat and the temperature in the radiator system is merely modulated at intervals, as required, by the establishment of circulation between the radiator system and the source.

Another object of our invention is to provide a heating system wherein a circulating and radiating system is provided with means for maintaining a forced, substantially constant circulation therein of heated fluid, in combination with a storage tank or other source of heated fluid at a relatively extremely high temperature, and means whereby the storage tank or supply is normally divorced from the circulating and radiating system, but is connected with it by means of a by-pass controlled by a valve which may interconnect the circulating and radiating system on the one hand and the storage tank or source of extreme heat on the other, whereby to supply to the radiating and circulating system a charge of fluid from the storage tank or other source to modify the temperature of fluid in the circulating system.

In the drawing:

Figure 1 is a vertical section through a heating system installation embodying our invention, certain parts thereof being shown in somewhat diagrammatic form.

Figure 2 is a detail of a valve suitable for use in our installation.

Like parts are identified by the same reference characters throughout the views.

In the drawing we have shown our invention installed in a heat exchange system which would be suitable for heating a home.

As shown in the drawing, our invention contemplates the use of a radiating and circulating system which includes radiators 10 through which heated fluid is circulated from a header 11 and through pipes 12 and 13. Return pipes 14 and 15 extend through a T connection 16, through pipes 17 and control valve 18 to pump 19, which forces a substantially constant circulation of fluid through the connections just described, by reason of the substantially constant energization of motor 20 connected to the pump 19.

As a second main element in our improved system, we provide a storage tank 21 for the storage of fluid at extremely high temperature with a feed pipe connection 22 to the main control valve 18 and a counterflow pipe connection 23 to feed into the bottom of the tank at 24, it being understood that no counterflow of fluid to the tank at 24 is possible unless the valve 18 is so adjusted as to permit flow of fluid through the feed pipe connection 22 into the circulatory and radiating system described above.

In stating that the fluid in storage tank 21 is of extremely high or low temperature, we mean that whereas in the usual hot water heating system in a home the temperature of fluid in the radiators 10 rarely is required to exceed 175 degrees, in the operation of our improved heating system the temperature of fluid in the tank 21 may reach the boiling point, or in some installations where pressure is permissible, the temperature may run as high as 240 degrees or more.

The temperature of the fluid in the tank 21 may be maintained by any suitable means known to the art. For instance, a feed connection through pipe 25 and the return lead 26 may supply the needed attachment to an ordinary hot water heater, or by means of suitable electric heating equipment installed directly in the tank 21, the temperature may be maintained automatically electrically, it being an important feature of our invention that the storage tank provide a supply of fluid at extremely high temperature for heating purposes.

Another very important element in our invention is the valve 18 and the control thereof, which fundamentally is intended to provide means for interconnecting the source of heated fluid with the circulatory and radiating system, and attention is directed particularly to the means for controlling the valve 18 as follows.

In a typical installation of a heating system in a building the radiators 10 are in a room above a floor 30 and the circulatory power and control devices and the storage tank 21 are in a room below. In the room heated by the radiator 10, we provide a thermostat 31 provided with a bimetallic unit 32 of a conventional configura-

tion as shown in Fig. 1 and the thermostat is provided with contact points 33 and 34 so that at high and low temperatures respectively one or the other of two electric circuits may be closed whereby a motor and speed reducer 35 may be energized for rotation in one direction or another to open or to close the automatic valve 18 referred to above.

While the electric circuit and a power control device for the motor and speed reducer 35 are not claimed to be novel, we have set forth in our drawing dual circuits for the control of the motor at 35, which circuits include a "ground" wire 36 connected to the thermostatic element 32, a valve closing wire 37 and a valve opening wire 38 connected to the contact wires 33 and 34 respectively, thus when the thermostat is cooled and the thermostatic element moves to the left to contact with the contact point 34 current is established through wire 38 and through the automatic reversing switch 39 and through the ground wire 36 to accomplish a valve opening operation in the valve 18.

When the thermostatic element 32 is heated, it moves to a position whereby to contact with contact point 33 and establishes an electric circuit through wire 37 and through the automatic reversing switch and through the ground wire 36 to energize the motor 35 for rotation in the opposite direction whereby to close valve 18.

Adjacent the thermostatic element 32 we provide preferably within the casing (not shown) around the entire thermostat a resistance element 40 which is in series with the circuit established when the thermostatic element is in contact with the contact point 34.

The motor and speed reducer 35 are provided with a crank arm 41 upon which a pitman 42 is mounted for connection with a valve plunger rod 43; the valve plunger rod 43 extends into the valve 18 and is provided in the valve with a valve plug 49 which is movable with the valve plunger rod 43 from the position shown in Fig. 2 where it blocks off the connection to the port 46 to an upper position against seat 48 where it will block off port 47 leading to port 44. A port 45 leads to a connection to the pump 19. The port 44 leads to a connection with pipe 17 and the port 46 leads to a connection with pipe 22. It thus appears that valve 18 is fundamentally a three-way valve. Normally, the valve is in the position shown in Fig. 2 with the connection through port 46 to pipe 22 completely closed, and in this position the connection from port 45 to port 44 is unobstructed through port 47.

Assuming that the valve plug 49 is in the position shown at 42, a complete cycle of operations of the valve may be described as follows: The thermostatic element being cooled by the constantly dropping temperature in the room affected by the radiator 10, will move to the left and contact point 34, thus energizing the motor at 35 and causing the crank arm and plunger rod to move the plug 49 against seat 48 to close port 47. At the same time the motor is energized for this operation, the resistance 40 is energized and is caused to radiate heat and thereby influence the thermostatic element 32 which will quite promptly move away from contact point 34 and establish a contact with point 33. The circuit through wire 37 will then be established and the motor, by reason of the automatic reversing switch, will move the crank arm oppositely and thus cause the plug 49 to move away from the seat 48, open the port 47 and close the port 46.

The structure above described is admirably suited to the modern heating or cooling of homes or other places where heated fluid may be suitably used in radiating and circulating systems, since the storage tank 21 may be provided with high temperature fluid at times of the day when electrical current may be cheaply procured, and the extreme temperature of the stored fluid may be maintained over a considerable period of time, during which only at intervals and comparatively momentarily the storage tank is connected into the circulatory and radiating system which we have described.

Likewise, where electrically induced heat is unobtainable or impracticable and usual hand fired boiler means are used, there is no necessity for extremely high and extremely low fluctuations of heat in a room heated by a radiating system merely because of inaccuracies and uncertainties of such hand firing, for no matter how high or how low the temperature in the storage tank 21 may prevail (provided that it does not go below the minimum needed in the radiators), the effective divorcement of the radiator system from the source of heat or cold will prevent extremes of temperature from affecting the radiating system except as the thermostat may repeatedly set up a cycle of operations of the valve 18.

We claim:

1. The combination with a source of stored fluid at extreme temperature, a radiator and complete circulatory system normally divorced therefrom, and a valve including means whereby to connect the source to the system at controlled intervals.

2. In a heating system provided with radiators and a circulating system for fluid passing through said radiators, a source of fluid at extreme temperature, a valve and pipe connections for establishing fluid connection whereby to include or exclude said storage tank within said circulatory system, means for moving said valve in a complete cycle of movement from closed to open position and back to closed position, and a thermostat for controlling said valve operating means, said thermostat being connected with a source of electric current and appropriate electrical connections to said valve operating means, whereby to intermittently initiate said cycle of operations.

3. The combination with a source of fluid at extreme temperature, a radiator and complete circulatory system normally divorced therefrom, a valve including means whereby to connect the source to the system at controlled intervals, said means including a thermostat within a zone influenced by the radiator system, a source of electrical current provided with a conductor circuit completed or disconnected by said thermostat, an electric heater unit in effective relation to the thermostat and energized or deenergized under control thereof, and a motor device responsive to the control of the thermostat and said source of electric power whereby to open and close said valve.

4. A heating process comprising the storing of heated fluid with minimum loss of heat by radiation, circulating a heat radiating fluid independently of the stored fluid and intermittently interchanging portions of the stored fluid and the circulating fluid and controlling such deliveries with reference to the temperature of medium receiving the radiating heat from the circulating fluid.

5. The combination with a source of fluid at extreme temperature, a radiator and complete circulatory system normally divorced therefrom whereby to provide space heating around the ra-

diator, a valve including means whereby to connect the source to the system at controlled intervals, a thermostat positioned in the space heated by the radiator system provided with electrical connections with an electric heater adjacent the thermostat and provided with connection to the thermostat for the heating thereof when the thermostat is cooled, and means controlled by the thermostat for momentarily opening and closing the valve when the thermostat is cooled.

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