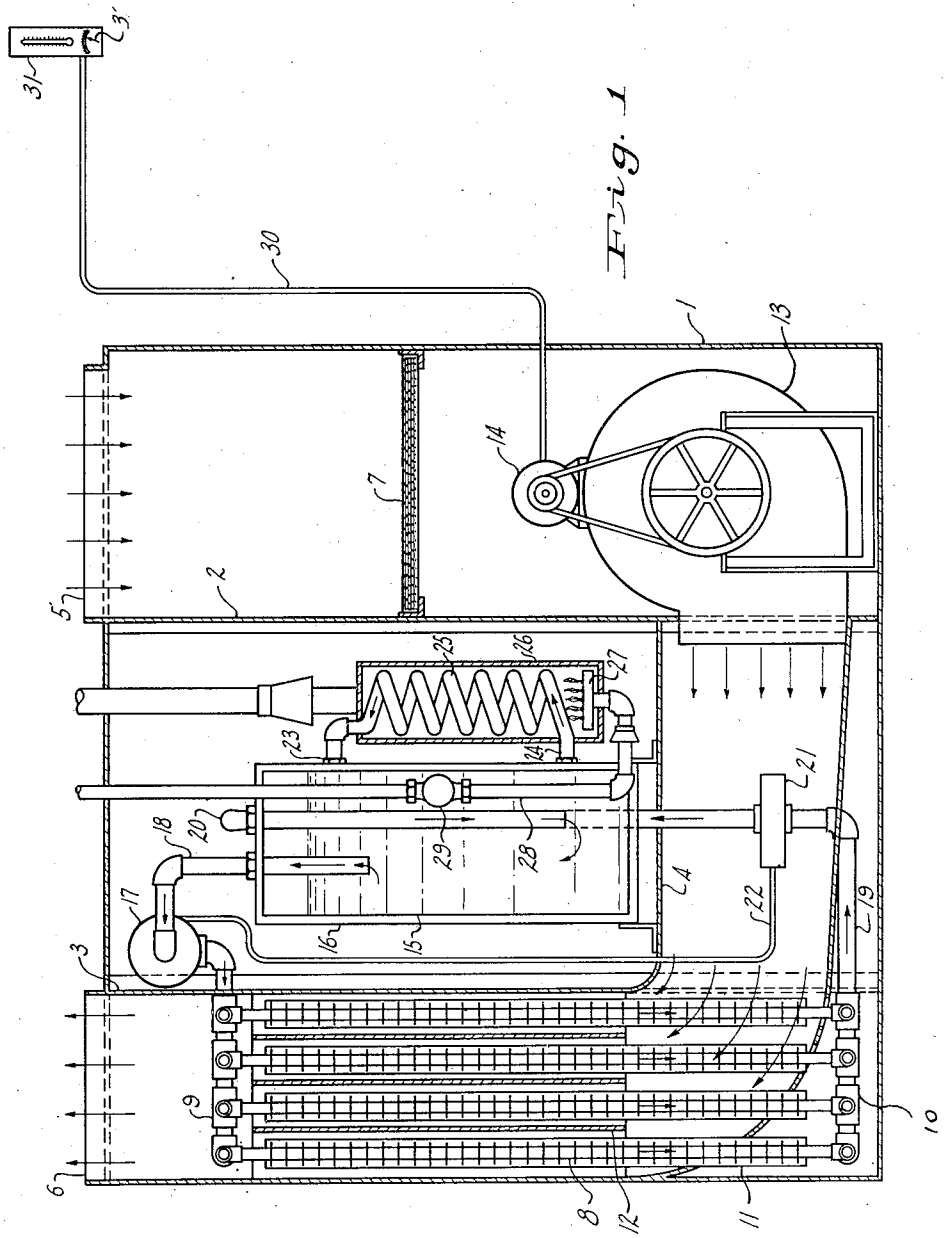
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HEATING AND COOLING SYSTEM

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Fig. 1



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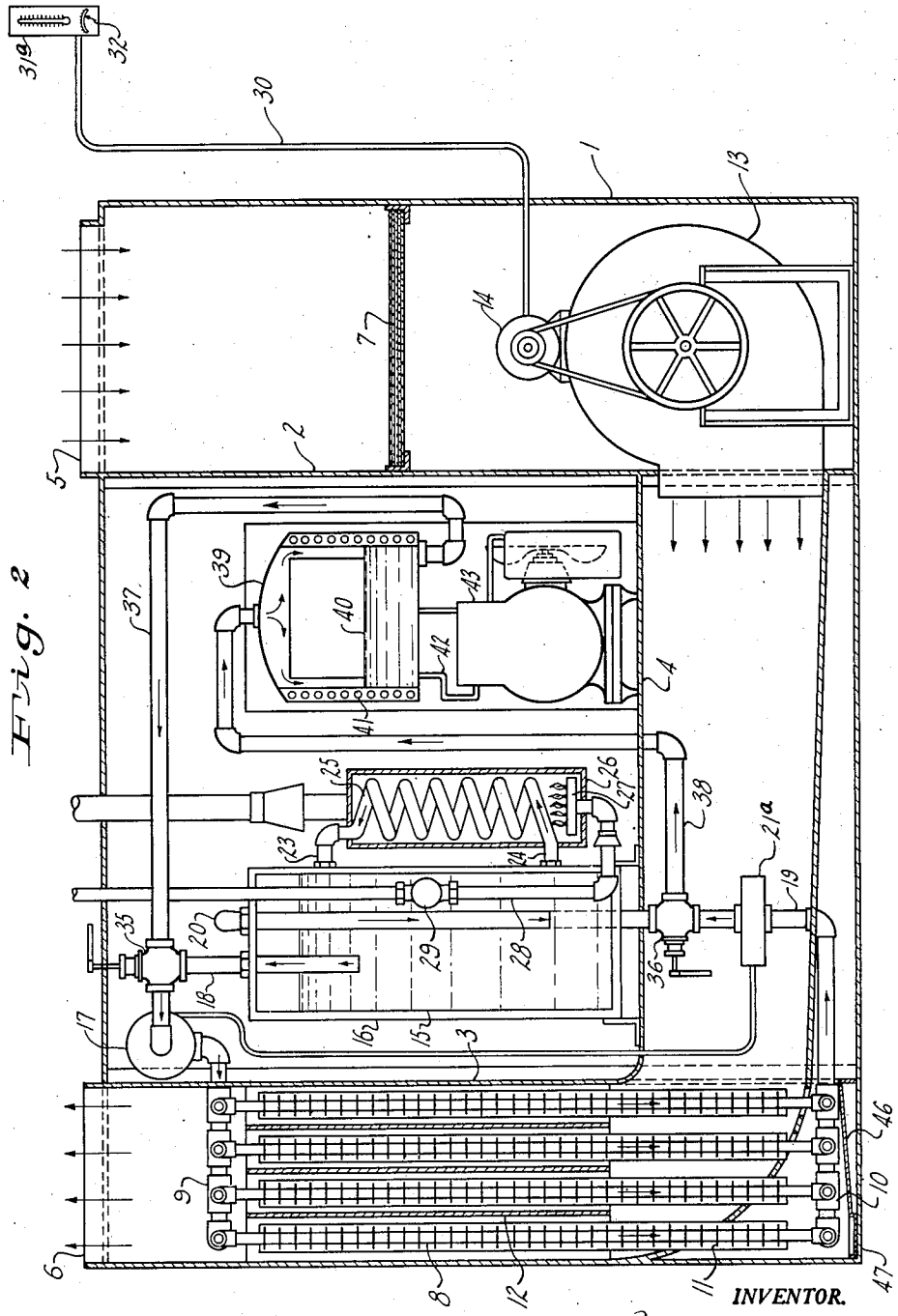
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Fig. 2



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HEATING AND COOLING SYSTEM

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2 Claims. (Cl. 257—3)

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This invention relates to heating systems for dwellings and the like, and it is among the objects thereof to utilize a hot water heating medium with improved means for circulating the same through a heating source of low fuel requirements.

It is a further object of the invention to provide a hot water heating system employing a heat exchanger in the path of the air flow which is of maximum heat exchange capacity and a water heating means of minimum heat capacity which shall be adapted to maintain a constant supply of heating medium independently of the heat requirements of the room to be heated.

Another object of the invention is the provision of a hot water heating system with means for maintaining circulation of the heating medium between the heat source and the point of heat exchange independently of the air flow controls. Still another object of the invention is the provision of a heating system which shall be convertible to an air conditioning system and which shall employ the same heat exchange elements and circulating system for the heating or cooling medium.

These and other objects of the invention will become more apparent from a consideration of the accompanying drawings in which like reference characters designate like parts, and in which

Fig. 1 is a vertical cross-sectional view, partially in elevation, of a heating system embodying the principles of this invention, and

Fig. 2 a similar view of a combined heating and air-conditioning system.

With reference to Fig. 1 of the drawings, the structure therein illustrated comprises a sheet metal housing 1 having vertical partitions 2 and 3 joined by a horizontal partition 4 to form an air circulating duct having an air inlet 5 and an air outlet 6. A filter 7 is disposed on the inlet side of the air duct and a series of conduits 8 on the outlet side, the conduits being connected to manifolds 9 and 10 and being provided with fins 11 to provide a maximum heat exchange area. The conduits 8 are partially enclosed in air flow cells 12 and are vertically disposed to provide maximum duration of contact of air passing vertically upward to the air outlet 6.

A blower 13 driven by motor 14 is mounted on the air inlet side of the duct for drawing air through inlet 5 past the filter 7 to the heat exchange chamber through outlet 6.

The heat exchange conduits 8 are connected through manifold 9 to a hot water storage tank 15 having a double wall 16, a pump 17 being provided for drawing hot water from tank 15 through conduit 18 and delivering it under pressure to manifold 9 from which it is uniformly distributed through the vertical heat exchangers 8 to the outlet manifold 10, the conduit 19 returning the

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liquid to the storage tank 15 through the connection 20. Pump 17 is motor driven and controlled by a thermostat 21 disposed in the return line 19, the thermostat being electrically connected by a conductor 22 to the motor of pump 17. The return line 19 is connected at 20 to the water supply line which may be regulated by a valve, not shown. Tank 15 is connected at 23 and 24 to the coil 25 disposed in a housing 26 having a burner 27 at the bottom thereof which is of the well known side-arm heater type. Burner 27 is connected by a conduit 28 to a source of fuel such as gas or oil, the flow of which is regulated by a thermostat 29, which is responsive to the water temperature in tank 15 to regulate the volume of fuel supplied to the heater 26.

Motor 14 is electrically connected by conductor 30 to a room thermostat 31 which may be set by the control indicator 32.

The operation of the heating system of Fig. 1 is briefly as follows. The circulation of hot water from the side-arm heater 26 to the storage tank 15 and from the storage tank through the heat exchanger tubes 8 and back to the tank is maintained independent of any demand for heat by the thermostat control 31, as follows. Thermostat 21 is set to energize pump motor 17 when the heating medium is at a given temperature and to deenergize the pump motor when a predetermined higher temperature prevails. When, therefore, the thermostat has energized motor 17, hot water will be drawn from the top of the storage tank 15 through conduit 18 to the manifold 9 and delivered under pressure through the heat exchange conduits 8 to the manifold 10 and returned to the storage tank 15. Simultaneously the water is circulated through the heating coil 25 above the burner 27 to make up any heat loss of the water passing through the heat exchange conduits 8. By this system of control a desired minimum temperature of the heating medium flowing through the heat exchangers is maintained at all times, which is available in response to any demand of the thermostat 31.

Assuming the thermostat to be set to a desired room temperature, if the temperature falls below the set temperature the fan motor 14 will be energized and the blower 13 will deliver air drawn through inlet 5 and the filter 7 to the heat exchange chamber as shown by the arrows, the air passing upward through the flow cells 12 in contact with the heat exchange tubes the full length of the tubes and thence out through the air outlet 6 into the room to be heated. The heat removed from the hot water passing through the heat exchange tubes 8 will cause a drop in temperature sufficient to operate thermostat 21, which will energize pump motor 17 and set up circulation of the hot water from tank 15. If the temperature of the hot water drops appreciably,

thermostat 29 will open the fuel supply valve to increase the heating temperature of coil 25, thus maintaining a balance of heat input to the heat supplied by the system. If the temperature of the circulating hot water exceeds the temperature for which thermostat 21 is set, the circulating pump 17 will be deenergized while the fan 13 may continue operation until the heat demand of thermostat 31 is satisfied. On the other hand, if the fan motor 14 is deenergized when the required room temperature has been reached, the hot water circulating system may continue to function until the water has reached the maximum temperature for which thermostat 21 has been set.

The combined heating and cooling system, utilizing the same circulating of the cooling and heating medium as shown in Fig. 1, will now be described in connection with Fig. 2. It will be noted that the hot water circulating system of Fig. 2 is identical with that of Fig. 1 except the addition of a manually controlled valve 35 in line 18 and a similar valve 36 in line 19, these valves being connected by conduits 37 and 38, respectively, to a refrigerating unit generally designated by the numeral 39. This unit utilizes a brine or other suitable cooling medium designated by the numeral 40 contained in a chamber surrounded by a coil 41 containing the refrigerant medium which is circulated by a conduit 42 through a compressor 43 that is motor operated and automatically controlled in the conventional manner to maintain the cooling medium 40 at a desired temperature. The cooling system is employed in the summertime when the hot water system is inoperative, valves 35 and 36 being set to disconnect the tank 15 from the circulating system and to directly connect the refrigerating unit with the circulating pump 17 and the thermostat 21*a*. The thermostat 21 and thermostat 31 will of course be set to function to energize the pump and fan motors 17 and 14, respectively, in response to increase instead of drop in temperature when the system is used for cooling or lowering room temperatures. When the thermostat 31*a* is set to a desired room temperature the fan motor 14 will be energized to draw air through the inlet 5 and filter 7 through the heat exchange chamber past the conduits 8 and delivered through the air outlet to the room. The cooling fluid 40 is continually circulated by pump 17 through the heat exchange conduits and returned to the tank 39 so long as the medium is above the temperature for which the thermostat 21*a* is set. When the predetermined temperature is reached pump motor 17 is deenergized independently of the operation of the fan motor 14, which may continue to supply the cool air to the room until it is disconnected by thermostat 31*a*.

When the apparatus is operated as a cooling system the moisture in the atmosphere will condense on the conduits 8 and drip on pan 46 to drain 47.

On the other hand, the fluid circulating system may operate independently of the thermostat control when no air is drawn through the system to maintain the fluid in the heat exchange conduits at a desired temperature in readiness for any demand for cold air by thermostat 31*a*.

By employing a self-contained heating and/or cooling system controlled independently of the temperature conditions prevailing in the room or chamber to be heated, the system is at all times prepared to deliver the maximum heat

or the maximum supply of cold air within the limits of its capacity. There is no lag period from the time the thermostat calls for hot or cold air until it is supplied, as in conventional types of hot air systems. Also by maintaining circulation of the heating or cooling medium to maintain a constant hot or cold temperature of the circulating medium in the heat exchange conduits, a heater or cooling apparatus of minimum capacity may be utilized.

As appears from the drawings, the system may be constructed as a compact unit requiring minimum space, the combined heating and cooling system of Fig. 2 being of the same height but of greater width or length than the heating system of Fig. 1.

Although one embodiment of the invention has been herein illustrated and described, it will be evident to those skilled in the art that various modifications may be made in the details of construction without departing from the principles herein set forth.

We claim:

1. In a hot air heating system, a U-shaped conditioning chamber constituting an air duct having an air inlet at the top of one leg and an outlet at the top of the other leg of the U, a blower for drawing air through said inlet and delivering the same to the outlet side of the duct, a motor for said blower having a thermostat control operative to energize said motor in response to temperature changes in the room to be heated, a plurality of heat exchange conduits disposed with their axes parallel to the path of flow of the air in the outlet leg of the U-shaped duct connected to a source of heating medium said conduits substantially filling the space of said leg, means for circulating the heating medium through said conduits, and means responsive to the change in temperature of the heating medium flowing through said conduits for energizing and de-energizing said circulating means independently of the operation of said blower.

2. In an air-conditioning system, an air duct having an inlet and outlet, means for maintaining air flow through said duct, a heat exchange conduit with its axis disposed parallel with the path of flow of the air in said duct, a cooling medium connected for circulation through said heat exchange conduit, a pump for circulating the cooling medium through said conduit, and a thermostat in the return line from said conduit to said source of cooling medium operative in response to temperature changes in the cooling medium for energizing and de-energizing said circulating pump.

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