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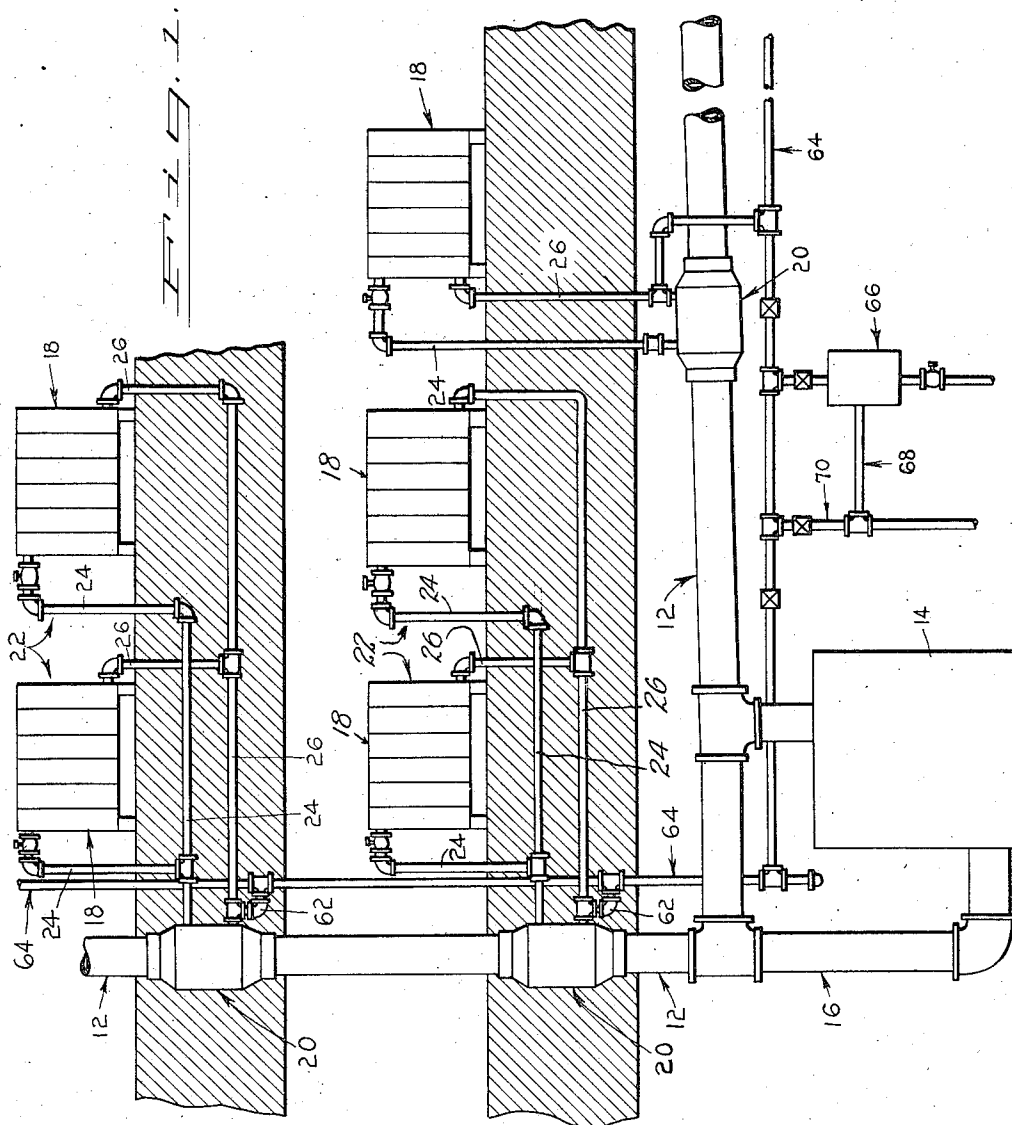
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2,024,508

HEATING SYSTEM

Filed March 29, 1933

2 Sheets-Sheet 1



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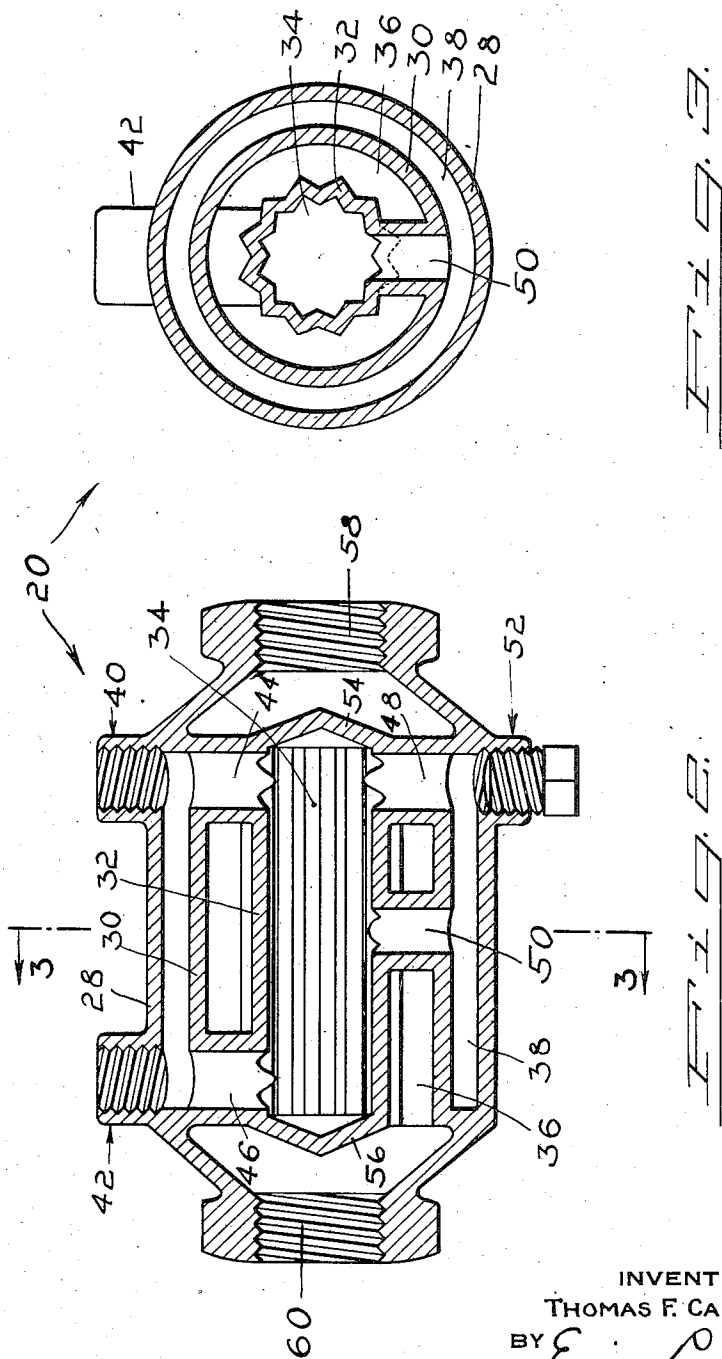
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HEATING SYSTEM

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5 Claims. (Cl. 237—58)

This invention relates to heating systems.

It is generally recognized in the art of heating dwellings, that the effects produced by the customary hot-water heating system, that is, a system in which the radiating members contain liquid which may be heated to a predetermined temperature, and in which such liquid is continuously circulated through the radiating members to maintain their surfaces at a constant temperature, are more desirable than those derived from systems which utilize the high temperature of a vapor medium such as steam. First among the reasons pressed in support of that desirability is the fact that inherent qualities of steam-heating systems, in most cases, result in operation of an intermittent character. If the full temperature of steam were permitted to remain constantly effective, and some method of control, all of which, to be accurate, are costly in character, were not employed, the temperature attained would become unbearable. For this reason, the procedure actually followed, as, for instance, in the heating of apartment houses, is to vary the supply of steam. One method employed is intermittently to shut down the steam supplying plant or source.

Furthermore, with varying firing of the furnace, generation of steam likewise varies sharply from a zero flow to a maximum supply. Even where control is supposedly exercised over the steam flow, variation from a heated, to an unheated, condition and vice versa, will occur. Radiators will quickly and sharply be brought up to peak temperatures of undesirable character; then, after an interval of continued or fluctuating heating at a very high and uncomfortable, humidity-superheating temperature, the heating-medium supply to the radiators suddenly is cut off, and the temperature permitted to drop to a low point. This cycle may be repeated many times during a single day. This type of heating has been found distinctly unhealthy not only because of the extreme, frequent and sudden variations in temperature, but also because of the drying effect of the extremely high temperatures attained by the surfaces of the radiators in such vapor-heating systems. Many attempts have been made to remedy that situation.

On the other hand, the system which utilizes the liquid-filled radiator is more desirable both by reason of the lower temperature at which the liquid is maintained, and because of the fact that the water body itself constitutes a heat reservoir. Only gradually will changes be made in the tem-

perature of such a reservoir, from a high to a low, and back again to a high, point.

However, a comparatively large body of liquid is to be considered, this body of liquid being a fluid of inherently much greater internal resistance to movement than is the case of vapor. Likewise, friction of such a fluid against the walls of conduits is greater than in the case of vapor. The movement of such liquid bodies, unless some active pump is used, which consequently would introduce an undesirable factor of cost, is entirely the result of thermo-circulation. When the bounds of such a system are determined by those necessary for heating multiple-floored dwellings, the system becomes cumbersome, inefficient and practically unmanageable. The hot water may flow from the central heating unit to one portion of the dwelling to be heated, but will not, at least to a desirable degree, flow in a similar manner toward other portions of the dwelling. Points furthest from the central heating plant will be least favored in point of time and effect as the slowly moving body of water must first displace the cold water from the entire system before that last point may receive any heat. Again, increasing height of the building to be heated results in a sharp increase in the water head upon the boiler. The boiler must, therefore, be constructed to compensate for this extreme pressure.

It is an object of the invention to provide a heating system into which the advantages of both steam and hot-water heating systems are embodied, with substantially complete elimination of the undesirable features of those systems. For this purpose, the heat-conveying medium, such as water, is converted into vapor at the boiler of the central heating plant. This vapor, steam where the medium is water, is conducted, under a desired pressure and with all the facility of steam transmission, to a point proximate to the particular place to be heated. The heat radiators at the place to be heated, however, are of the liquid-containing type.

With the steam conduit are associated means for effecting an interchange of heat from the steam to the water in the radiators. These heat interchangers have chambers connected for direct communication with the liquid-containing radiators, the liquid from the radiators flowing through the chambers and being heated by the steam. Thus, as the steam passes to a heat-interchanging unit, a supply of heat energy is imparted to the liquid, then to be transmitted to the radiator for radiation into the place to be heated. As variations occur in the steam supply, 55

fluctuations in the temperature of the liquid body in the radiators will be modified so that but slight increases or decreases in that temperature may occur; the inertia of the total heat content of the body of liquid in the radiator prevents any undesired sharp variation in temperature at the radiators.

It is an object of the invention to provide a heat-interchanging unit comprising a plurality of contiguous chambers, preferably concentrically arranged, through which steam and water pass, the steam being directed so that it passes around and through the water chambers. Furthermore, this arrangement is such that the heat-interchanging units are affected as much by the condensate of the steam as they are by the steam itself, steam condensate flowing down along the walls of the water-containing chambers and thus giving up heat to these walls to which it so intimately adheres.

The system may also include an automatic means for maintaining in each of the radiators the requisite amount of liquid. Each radiator or each system of radiators and its heat-interchanging unit may be made otherwise entirely independent of the other radiators or systems, where a plurality of radiators or systems are employed and heated from the common vapor source.

Other objects of this invention will hereinafter be set forth, or will be apparent from the description and the drawings, in which is illustrated an embodiment of apparatus for carrying out the invention.

The invention, however, is not intended to be restricted to any particular construction or arrangement of parts, or to any particular application of such construction, or to any specific method of operation, or to any specific manner of use, or to any of various details thereof herein shown and described, as the same may be modified in various particulars or be applied in many varied relations without departing from the spirit and scope of the claimed invention, the practical embodiment herein illustrated and described merely showing one of various forms and modifications in which the invention might be embodied.

On the drawings, in which the same reference characters refer to the same parts throughout, and in which is disclosed such a heating system:

Fig. 1 is an elevational diagrammatic view of a heating system embodying features of the invention;

Fig. 2 is a transverse vertical cross-sectional view through a heat-transferring unit which may be used in the system; and

Fig. 3 is a cross-sectional view, on the line 3-3 of Fig. 2.

The present heating system includes a riser 12, controlled by any suitable valve or similar means, not necessarily an element of this invention and not shown on the drawings. The riser may lead away from any source of heated vapor, as, for instance, a boiler 14 which may be of any preferred design. The riser may be provided with suitable condensate returns 16 for bringing back into the boiler the hot condensate, again to be vaporized. Where a plurality of radiators are to be used for heating, as, for instance, one on each of the floors of a multiple-floor building, or, as it may be desired, one on each section of a floor, or in the case of a single radiator 18, then, for each radiator or associated numbers of radiators, there is inserted into the riser a heat-transfer-

ring unit 20. A heat-transferring unit may be connected to each radiator 18, or a plurality of associated radiators may be assembled into a system 22, and a unit 20 connected as the hot-water supply for that system. Riser 12 may extend from floor to floor, and at each floor, the same relationship of radiators and heat-transferring units may be set up, that is, a unit may be provided for one or more radiators. In this manner, a plurality of systems 22, each system including a unit 20 and one or more radiators 18, operate substantially independently of each other except for their common heat supply.

Each of the radiators includes the usual hot-water inlet line 24 and a return line 26, these two lines being in communication with unit 20. The latter, may, if desired, be made as a casting, and, as shown in Figs. 2 and 3, may consist of an external casing 28 and internal casings 30 and 32, here shown concentrically arranged to define a central chamber 34, an annular chamber 36 and an outer chamber 38. Lines 24 and 26 open into chamber 38, line 24 preferably being connected at a nipple 40, while line 26 is connected to nipple 42. There are passageways 44, 46, 48 and 50 forming communications between chambers 34 and 38. An auxiliary nipple 52 may be provided, as an alternate for nipple 40, a plug normally closing it. If nipples 42 and 52 are used, liquid must move transversely across the unit from entrance to exit.

Chamber 34 may be closed by head 54 and 56, the passageways 44, 46, 48 and 50, by the metal forming them providing support for casing 32 which defines it. The ducts which define the passageways do not close off communication with chamber 36 from headers 58 and 60 in which casing 28 terminates. Headers 58 and 60 provide smoothly flowing communication between chamber 36 and riser 12, the steam flowing from the riser, through annular chamber 36, and up and out again into the riser. Thus not only are casings 30 and 32 heated by the steam, but condensate, forming in chamber 36 and above in the riser, will flow down along its walls, thus more efficiently effecting the interchange and heating water in chambers 34 and 38. The water then circulates through the radiators of the system in which that unit is connected.

Connected into the return line 26 of each system, just immediately ahead of nipple 42, is a conduit 62 connected to a cold-water supply line here shown as a riser 64, the upper end of which may extend higher than the level of the topmost radiator in the building. Riser 64 extends down to an automatic water-feed 66, preferably closely adjacent the lowest point of the system. Water-feed 66 functions, as is well-known, to force into the system sufficient liquid to maintain a constant head in the riser to keep the radiators of the system properly supplied with liquid. A discharge line 68 leads away from water-feed 66 and may, together with the system-drain 70, discharge into a convenient outlet.

In this manner, steam passing through riser 12 heats the liquid within chambers 34 and 38. The liquid then circulates through the radiators for heating the rooms or other portions for which they are provided. The ease in transmission of steam is thus availed of, while the advantages of heating at lower temperatures and the storage of heat units in hot-water systems is availed of.

Many other changes could be effected in the

particular apparatus designed, and in the methods of operation set forth, and in specific details thereof, without substantially departing from the invention intended to be defined in the claims, the specific description herein being to illustrate an operative embodiment of the spirit of the invention.

What is claimed as new and useful is:—

1. Apparatus for heating a building, wherein a plurality of liquid-containing radiators constitute the direct means for supplying heat to those portions of the building to be heated, which comprises: a plurality of heating systems within the building at different levels, each of the systems including independent liquid-containing radiators at the same level, a source of a heated vapor, each of the radiator-containing systems including a heat-transferring means separate from the radiators in said systems, means for conducting vapor from the vapor source through the transferring means, and means for conducting liquid from the radiators of the heating system at a given level through the transferring means of that particular system in heat-interchanging relation to the vapor passed there-through, a cold-water supply line common to said systems at different levels, and an individual connection between said supply line and the radiators at the same level.

2. Apparatus for heating a building, wherein a plurality of water-containing radiators constitute the direct means for supplying heat to those portions of the building to be heated, which comprises: a plurality of heating systems within the building at different levels, each of the systems including independent water-containing radiators and supply and return piping therefor at the same level, the circulation of the water through a system at one level being independent of the circulation of the water through a system at a different level, a steam supply source, and a conduit for the steam leading away from the source, each of the radiator-containing systems including separate means interposed directly in the conduit for transferring heat to the water in the radiators.

3. Apparatus for heating a building, wherein a plurality of water-containing radiators constitute the direct means for supplying heat to those portions of the building to be heated, which comprises: a plurality of heating systems within the building at different levels, each of the systems including independent water-containing radiators and supply and return piping therefor at the same level, the circulation of the water

through a system at one level being independent of the circulation of the water through a system at a different level, a steam supply source, and a continuous conduit for the steam leading away from the source, each of the radiator-containing systems including separate means interposed directly in the conduit for transferring heat to the water in the radiators, a cold-water supply line common to said systems at different levels, and an individual connection between said supply line and the radiators at the same level.

4. Apparatus for heating a building, wherein a plurality of water-containing radiators constitute the direct means for supplying heat to those portions of the building to be heated, which comprises: a plurality of heating systems within the building at different levels, each of the systems including independent water-containing radiators and supply and return piping therefor at the same level, the circulation of the water through a system at one level being independent of the circulation of the water through a system at a different level and separate heat-transferring means at substantially the same floor level, a steam supply source, the heat-transferring means including contiguous water and steam-containing chambers, and a continuous conduit for the steam leading away from the source and to the steam-containing chambers of the heat-transferring means of all the systems, the steam-containing chambers of the heat-transferring means interposed directly in and forming a part of the conduit.

5. Apparatus for heating a building, wherein a plurality of water-containing radiators constitute the direct means for supplying heat to those portions of the building to be heated, which comprises: a plurality of heating systems within the building at different levels, each of the systems including independent water-containing radiators and supply and return piping therefor at the same level, the circulation of the water through a system at one level being independent of the circulation of the water through a system at a different level and separate heat-transferring means, a steam supply source, the heat-transferring means including a plurality of water-containing chambers and means for conducting steam between the chambers, and a continuous conduit for the steam leading away from the source, the steam-conducting means of the heat-transferring means interposed directly in and forming a part of the conduit.

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