

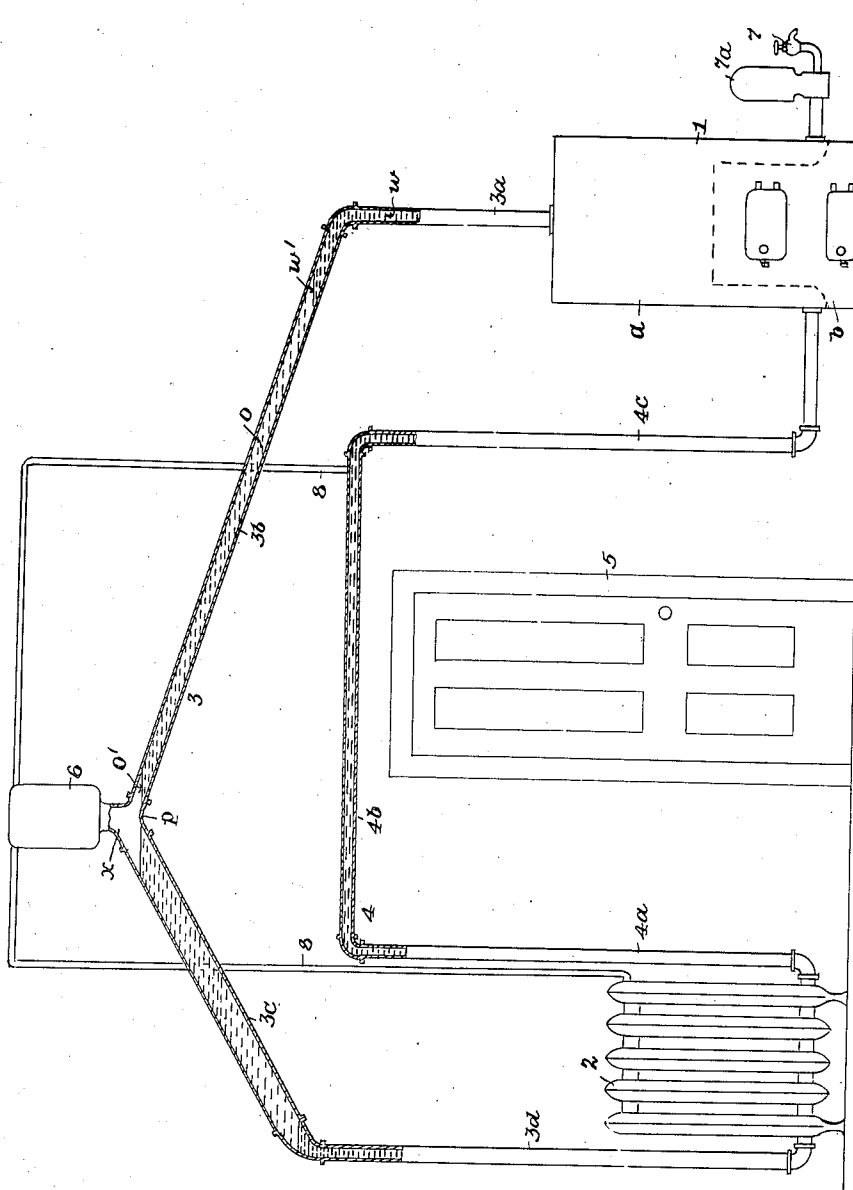
Feb. 7, 1939.

C. P. KNIPPER

2,146,148

HEATING SYSTEM

Filed May 18, 1937



BY

INVENTOR,
Charles F. Knipper,
John M. Howard.
ATTORNEY.

UNITED STATES PATENT OFFICE

2,146,148

HEATING SYSTEM

Charles P. Knipper, Paterson, N. J.

Application May 18, 1937, Serial No. 143,263

5 Claims. (Cl. 237—59)

In a hot-water heating system the maximum heat (in the form of sensible heat and the heat of evaporation) is always at the top of the system where it is least wanted.

5 Further, without the use of some mechanical auxiliary, difficulty is met with in the effort to obtain circulation through a radiator arranged more or less at the level of the boiler or other container where the heat is applied, and of course
10 this difficulty increases the further the radiator is laterally displaced from the boiler and hence the more the pressure head is relatively reduced, and it will also of course manifest itself where
15 for any reason the water has to encounter some upreach in the return of the system, as where the return has to be bent up and over a door or window or perhaps is to reach to some level below the boiler and then return to that level.

By superimposing on the water or other liquid
20 which serves as the heat-conveying medium a liquid having less specific gravity than the first liquid I find not only that vaporization of the latter may be prevented and that there will in effect be a depressing of the hottest part of the
25 system from the top thereof to a lower level, but that in such instances as those indicated above I can effect circulation where it would otherwise be impossible to accomplish it or stimulate it where it would otherwise be sluggish. If the
30 heat-conveying liquid is water the other liquid may be an oil, as kerosene oil. However, it is obvious that my invention is not concerned with what two liquids are used so long as one has less specific gravity than the other and the latter is
35 a good heat-conveying liquid. Preferably, the liquid having the less specific gravity will also have the less specific heat, which will usually be the case where the heat-conveying liquid is water and the other liquid an oil.

40 Suppose water is used as the heat-conveying liquid and oil as the other liquid, the oil being of appreciably the lesser weight, as by 20%. In the ordinary hot-water heating system the difference in weight between the heated and cooled
45 water is between 2 and 4%. According to my invention this factor responsible for inducing circulation is augmented by the difference in weight between the oil and water. That is, in the riser of the conductor expansion of the water ensues
50 and results in the elevation of the water surface to the crest or peak of the conductor, followed by its fall into the conductor return and consequent displacement by each unit of the water of a corresponding unit of the oil, which is about
55 20% lighter than the water. In short, according

to the invention there are two factors active in promoting circulation: the difference in weight between the heated and cooled water and the difference in weight between oil and water.

The quantitative proportions of the two liquids
5 (as water and oil) should be such that on charging the heat-conveying liquid with heat and thus expanding the same the pressure incident to the weight of the other liquid on the first liquid will maintain the latter in liquid state until its surface
10 portion attains the level of the mentioned crest or peak (which level I term the peak level) and so, still in liquid state, can debouch into the return of the conductor. This being so, the surface of the oil stratum may be at any level,
15 though to allow for expansion in the system it will be such as to afford a space above it.

The invention is illustrated diagrammatically and merely by way of example in the accompanying drawing in which the system is shown mainly
20 in elevation but, at the upper part, largely in section.

Let 1 be a hot-water heater which, as usual, will embody relatively above the dotted line some water container, as *a*, and below said line, as at *b*,
25 any means to heat the water in such space *a*. 2 is a radiator or other heat-dispensing unit. A pipe 3 leads upwardly, as at 3*a*, from the top of container *a*, vertically, then rises at an incline, as at 3*b*, then descends at an incline, as at 3*c*,
30 and then descends vertically, as at 3*d*, to the radiator. Another pipe 4 leads from the radiator to a relatively low part of the container *a*. The container *a*, pipes 3 and 4, and the radiator have their spaces all in communication with each other
35 and they together form the conductor in which the water is to circulate when heated by the means at *b*. What I term the riser of this conductor comprises the parts *a*, 3*a* and 3*b*; its return comprises the parts 3*c*, 3*d*, 2 and 4. The
40 portion of the conductor which extends from its portion 3*d* to the boiler is shown to pass over some obstacle which prevents its being extended straight, as a door 5 in some apartment which the system is to heat; hence it has an upreach at 4*a*
45 and then extends at 4*b* to a downreach 4*c* and thence to the boiler. In the ordinary hot-water heating system a relatively cool body of water would stand in the downwardly extending bend or U of which the upreach forms a part or leg
50 and oppose circulation. This is overcome and the other mentioned advantages attained by the present invention. Thus:

Upon the water in the conductor, indicated at *w* by the heavier section lines, is a stratum of
55

oil, *o*, as kerosene oil, indicated by the lighter section lines. In the present example the surface of the water when the system is cool or in its state before operation (at atmospheric temperature) is at *w'* and the surface of the oil is at *o'*. When the heating of the water is effected, as by the heating unit at *b*, the water expands and its surface rises in the riser until the peak-level *p* of the conductor is reached, whereupon the water spills over into the return and, having displaced the (lighter) oil, the difference between its weight and that of the oil displaced becomes a factor, augmenting that incident to the cooling of the water as it departs from the heat source, in promoting circulation. Assume that the crest *p* is ten feet above the bottom of the system, that the initial water temperature is 70° F., and that a temperature of 140° F. is required to bring the water level in the riser to the crest upon the heating thereof. Now suppose, on the one hand, that the system is filled with water to the 7.5 foot level and that there is a 2.5 foot oil layer superimposed on the water; and, on the other hand, that there is only water present in the system with its surface at the 7.5 foot level. Now assume that in each case the water in the riser is heated to bring its level to the crest (though in fact it might burst into steam in either case before it attained the crest in the still liquid state). In the first case when the water level in the riser attains the crest that in the return will have a "lag" of 0.732 feet (or 8.784 inches), whereas in the second case the water level in the return will have a "lag" of only .1445 feet (or 1.734 inches). Hence, there being a state of balance in both examples (in riser and return) up to the time the water in the riser attained the crest, on the debouching of the water from riser to return which will thereupon ensue with continued heating, there will be about 500% greater possibility of overloading the return in the first case than in the second. It is to be borne in mind that, whereas the density of water at, say, 70° F. is 62.3 and at 140° F. is 61.3, the density of oil at these temperatures remains changed relatively little or, practically, substantially the same.

Of course there should be some space or retreat into which the oil displaced by the expanding water in the riser and prevented from being accommodated in the return by the contents of the latter, may be received, wherefore the space *x* above the peak level will usually be augmented by an expansion tank, such as 6.

The device shown at 7 is the usual pressure-relief valve and at 7a is an expansion tank associated therewith. These are not indispensable to my invention so far as its principles of operation are concerned.

It might happen that oil entrained with the water would pass downwardly in the return to become lodged in some upwardly reaching pocket thereof, as the radiator or perhaps the bend formed by the parts 4a—4b—4c, and so constitute a barrier to the circulation of the water. To permit the escape of the oil otherwise so entrapped I may provide conductors 8 leading from the top of any such pocket and discharging into the main conductor above the maximum oil level, as into the top of the expansion tank 6.

In order to insure down-flow of water in the

part 3c of the return and a counter or up-flow of oil therein said part 3c may have a greater internal area than the rest of the piping shown.

Whereas in the present example the mentioned peak-level is defined by an upwardly pointing angle, whereby when the surface of the water in the riser attains the peak-level it will at once fall into the return, the invention is not to be understood as correspondingly limited.

In the appended claims in reference to the liquids I use the term liquid body or liquid bodies, having in mind that either liquid constituent may include a plurality of liquids as well as a single liquid.

Having thus fully described my invention what I claim is:

1. The hereindescribed liquid circulating system including, with an endless liquid conductor having a portion thereof forming a riser and a return and providing between such riser and return the herein-defined peak-level of the conductor, a heat-conveying liquid body in the conductor having its surface in a plane cutting the riser and return and a liquid body of less specific gravity than and superimposed on the first body in the riser and return, the quantitative proportions of said liquid bodies being such that on charging the first liquid body at a point in the riser with heat and thus expanding the same the pressure of the second-named on the first-named liquid body will maintain the latter in liquid state until the surface portion thereof attains said peak level.

2. The hereindescribed liquid circulating system including, with an endless liquid conductor having a portion thereof forming a riser and a return arranged to define interiorly of the conductor an upwardly pointing angle affording the hereindescribed peak-level of the conductor, a heat-conveying liquid body in the conductor having its surface in a plane cutting the riser and return and a liquid body of less specific gravity than and superimposed on the first body in the riser and return, the quantitative proportions of said liquid bodies being such that on charging the first liquid body at a point in the riser with heat and thus expanding the same the pressure of the second-named on the first-named liquid body will maintain the latter in liquid state until the surface portion thereof attains said peak level.

3. The system set forth in claim 1 characterized by the quantity of the second liquid body being such that the whole thereof cannot be accommodated in the conductor on expansion of the first liquid and by a retreat for the second liquid communicating with the conductor above the indicated plane.

4. The system set forth in claim 1 characterized by the uppermost portion of said return being enlarged to present an increased internal area.

5. The system set forth in claim 1 characterized by the said return having a portion thereof affording an upwardly reaching pocket and means, leading from the top of said pocket and discharging into the conductor above the indicated plane, for conducting from said pocket the liquid of such second-named liquid body which collects therein.

CHARLES P. KNIPPER.