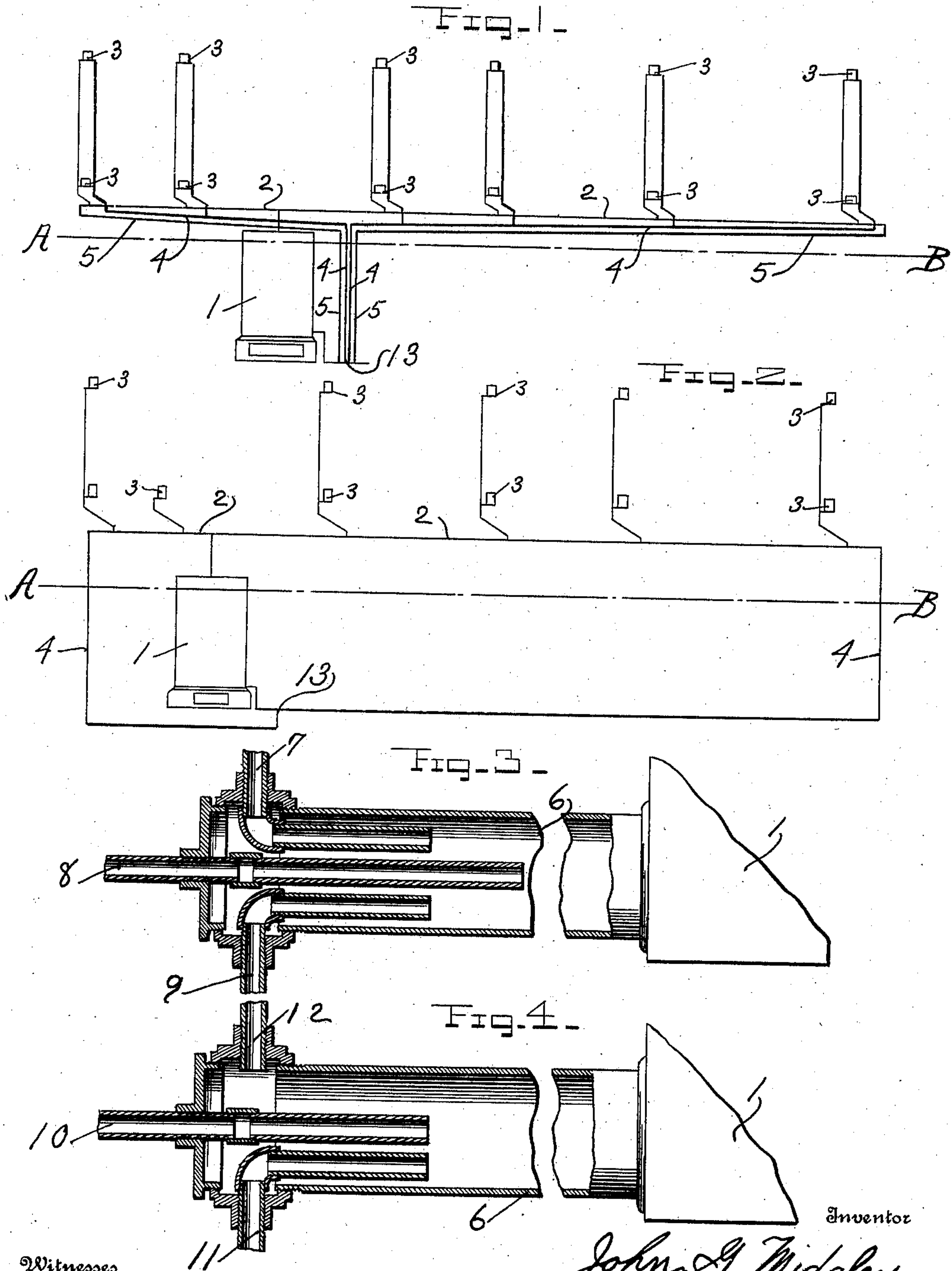


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STEAM HEATING SYSTEM.
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STEAM-HEATING SYSTEM.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN G. MIDGLEY, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake, State of Utah, have invented certain new and useful Improvements in Steam-Heating Systems, of which the following is a description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to steam heating apparatus, and more particularly to such types of steam heating apparatus or systems as are commonly designated as low pressure gravity return systems for the reason that the steam pressure which exists in such systems seldom rises to more than a few pounds above atmospheric pressure, and is frequently below atmospheric pressure, and the water resulting from the condensation of the steam which leaves the boiler returns to the boiler by gravity and without the assistance of any device other than a properly designed system of return piping. In such systems and notwithstanding the fact that the condensed steam is intended to and in theory would return to the boiler by gravity and without the assistance of auxiliary devices, difficulties are met with in the practical application of such systems in securing a proper flow of the water thus produced back to the boiler; and my invention relates to that portion of systems of the type above specified having to do with the return of the water resulting from the condensation of the steam in the system back to the boiler, and is designed to secure a uniform and continuous flow of such water back to the boiler under the adverse conditions met with in the practical installation and use of such systems.

The reference to water resulting from the condensation of the steam in the system above made is intended to be broad in scope and to comprehend all the water resulting from the condensation of the steam which passes from the boiler into the steam heating system. A portion of this water may be specifically designated as drip, by which term the water resulting from the condensation of steam within the pipes and which steam has not entered the radiators is commonly referred to; while another and much larger portion may be referred to as water of condensation, by which term the water resulting from the condensation of

the steam which has entered the radiators and has imparted its heat to the apartment to be heated is commonly referred to in practice. The former of the portions of the water resulting from the condensation of the steam will be materially hotter than the latter portion, because it will be initially at a temperature corresponding with that of the steam before it enters the radiators, while the temperature of the latter portion will be at practically the temperature of the radiators.

Among the adverse conditions met with in practice and which my invention is designed to counteract may be mentioned the following: In systems of the type referred to the pressure existing in the several radiators frequently varies considerably owing to the various distances of the separate radiators from the boiler, the character and size of the single steam supply pipe assumed to be used, and the adjustment of the radiator valves, from which differences in pressure it will result that the water of condensation flowing from the several radiators will be subjected to variations of pressure and the water of condensation collected in the single return main will be subjected to several different pressures and will tend to flow toward the point of lowest pressure, or at least the flow thereof toward the boiler will be considerably interfered with by the conditions existing in the system. The difficulty here mentioned is particularly present with the radiators located most remote from the boiler. The same conditions in connection with the commonly varying temperatures of the various apartments heated will result in the several portions of the water of condensation from the radiators being of different and often widely varying temperatures, and the fact that the drip is always much hotter than the water of condensation further complicates the problem of returning the water resulting from the condensation of the steam back to the boiler; for it is found that two streams of the water resulting from the condensation will if of widely varying temperatures, not mix readily, and such conditions will interfere with a proper return of the water to the boiler.

It will be understood that my invention contemplates the return of the various streams of water above referred to back to

the boiler through a single return main notwithstanding the adverse conditions above set forth due to their variations in pressure and temperature, which conditions have heretofore interfered materially with a satisfactory and effective return of the water through a single return main.

It has been proposed to overcome the adverse conditions above enumerated by providing a plurality of steam supply pipes each leading to a single radiator, or to a small group of radiators, but this scheme is satisfactory only to a limited degree, and it is found that the conditions existing at the more distant radiators differ to such an extent from the conditions existing at the nearer radiators as to materially interfere with the flow back to the boiler. My invention accepts the adverse conditions, observed to be always present in such systems to a greater or less degree and believed to be unavoidable in practice, and aims to counteract the adverse results commonly following from such conditions and to secure a satisfactory return of the water resulting from the condensation of the steam back to the boiler through a single return main notwithstanding such adverse conditions.

I have illustrated an embodiment of my invention in the accompanying drawing, the form of such embodiment being shown in some of the many forms which it may assume, and have described my invention in the following specification and particularly claimed it in the clauses of the concluding claim.

I refer to my device as a steam heating system because of the fact that my invention contemplates and is designed to assist in the operation of elements forming a part of steam heating systems of common type both as to structure and general mode of operation. It will, however, be understood that existing steam heating systems may be equipped with elements whereby they will be so modified as to come within my invention, the boiler, radiators, and a considerable portion of the mains whereby steam is supplied to and water returned from the radiators being of the same construction in my improved as in former systems.

Figure 1 is a view illustrating by way of a diagram a steam heating system and showing the location of my device therein, Fig. 2 is a similar view showing my device employed in a modified type of steam heating system, Fig. 3 is a sectional view illustrating the portion of a steam heating system to which my invention relates, and illustrating an application of my invention to a steam heating system, and, Fig. 4 is a similar view illustrating another method of applying my invention to a steam heating system.

In the drawings, 1 indicates a steam boiler of any approved type, and 2 is a steam supply pipe leading from the boiler and having branches leading to the various radiators 3.

4 are return pipes through which the water of condensation from the radiators flows back to the boiler 1, and 5, Fig. 1, are separate return pipes through which the drip resulting from the condensation of steam in the steam supply pipe 2 returns to the boiler. In the system shown in Fig. 2 both the drip and water of condensation from the radiators return through the same pipe. In both Figs. 1 and 2 the line A—B indicates the level of water in the boiler 1.

My invention is not concerned with the portion of the heating system thus far disclosed, and the steam may be supplied to the radiators by a single pipe or by a separate pipe leading to each, or they may be arranged in groups with a pipe leading to each group. Likewise the water resulting from the condensation of the steam which leaves the boiler may be conducted toward the boiler through one or more pipes provided for the water of condensation and through one or more other pipes provided for the drip, or both the drip and water of condensation may flow from a given locality through a single return pipe. Any arrangement whereby steam is supplied to radiators and the water resulting from the condensation of the steam is conducted back toward the boiler through suitable pipes may be employed as forming a part of the improved system wherein my invention consists.

My invention contemplates and the principle thereof is illustrated in a device wherein the water resulting from the condensation of the steam within the system flows from different portions of the system toward the boiler in two or more streams substantially parallel with one another and for an appreciable distance before they are permitted to mingle and form a single stream flowing toward the boiler. From this feature it results that one stream does not act in opposition to another nor tend to oppose its flow, and the momentum present in all of the streams is present and undiminished in quantity in the single stream which results from mingling the several streams from the various parts of the system. The action is thus in some respects similar to the action of an ejector utilizing and operating upon one kind of fluid except that my invention contemplates the presence of forces which tend to cause both streams entering the ejector to flow, and utilizes and directs those forces so that they mutually contribute to produce movement of the single resulting stream, whereas in an ejector the momentum of the resulting stream is commonly derived entirely from a single impelling medium. The rate of movement of the several streams is,

furthermore, usually much slower in a steam heating system equipped with my invention than in an ejector.

Referring to the drawings, Fig. 3 illustrates the principle of my invention wherein 6 is a common return main leading to the boiler 1, and 7, 8 and 9 are a plurality of pipes through which water derived from the condensation of steam in the system is conducted to the main 6. The water flowing in these pipes will be either drip or water of condensation from the radiators, according to the arrangement and necessities of the system, and as many such pipes will be provided as the system may require. The pipes above referred to are shown as all continuing for a considerable distance within the main 6, so that the several streams flow parallel with one another but kept apart by the wall of the several pipes for a considerable distance before the several streams are permitted to mingle and form a single return stream. I prefer to extend the pipes above referred to for varying distances within the main 6, to which end the pipe 8 is shown as continuing beyond the ends of the pipes 7 and 9, in which case water flows through all the pipes in parallel streams as above, and, after the streams from the pipes 7 and 9 mingle to form a single stream, this stream flows parallel with but is kept apart from the water in the pipe 8 for a farther distance before the water flowing in the pipe 8 is permitted to join and mingle with the stream flowing in the return main 6.

In the form shown in Fig. 4 two pipes 10 and 11 enter and extend within the main 6, while a third pipe 12 discharges into the main. There will, however, be a parallel flow of the several streams before they mingle.

It will be obvious that in the simpler forms of my system a parallel flow of two streams for an appreciable distance before they are permitted to mingle and form a single stream will be sufficient to secure a satisfactory return flow of water to the boiler, and it will be obvious that the two streams above referred to may come from single separate sources, or one or both of such streams may be made up of water derived from a plurality of separate sources.

A device similar to that shown in Figs. 3 and 4 and whereby a parallel or substantially parallel flow of two or more streams of water from the system is secured will be installed below the water line of the boiler at a point indicated by the reference character 13, it being understood that the length of the return main between such device and the boiler is immaterial and that as many connections such as 7, 8, 9, 10, 12 and 13 are provided as may be necessary in order to accommodate all of the streams of water returning from the various parts of the system.

Having thus described my invention and explained the mode of operation thereof, I claim and desire to secure by Letters Patent:

1. In a low pressure steam heating system, a boiler having a suitable steam supply main for supplying steam to the system; a return main communicating with said boiler for conducting water resulting from the condensation of steam in the system back to the boiler; a plurality of pipes communicating with separate portions of the system and leading back to said return main for conducting the water thus produced from separate portions of the system back to said return main; and means whereby separate streams of water returned to said return main through said pipes are caused to flow within said main substantially parallel with but kept separate from one another throughout an appreciable distance before they are permitted to mingle and form a single stream, said means being located below the level of water in said return main.

2. In a low pressure steam heating system, a boiler having a suitable steam supply main for supplying steam to the system; a plurality of pipes communicating with separate portions of the system for conducting water produced by the condensation of steam in the system from separate portions thereof toward said boiler; means whereby separate streams of water flowing in said pipes are caused to flow substantially parallel with but kept separate from one another throughout an appreciable distance and are then permitted to mingle and form a single stream, said means being located below the level of water in said boiler; and means communicating with said boiler and adapted to receive and conduct the resulting single stream of water back to the boiler.

3. In a low pressure steam heating system, a plurality of radiators; means including a boiler and suitable steam supply pipes for supplying steam to each of said radiators; a single return main communicating with said boiler for conducting water resulting from the condensation of steam in the system back to the boiler; a plurality of pipes communicating with separate portions of the system and leading back to said return main for conducting the water thus produced from separate portions of the system to said return main; and means whereby separate streams of the water returned to said return main through said pipes are caused to flow within said main substantially parallel with but kept separate from one another throughout an appreciable distance before they are permitted to mingle and form a single stream, said means being located below the level of water in said return main.

4. In a low pressure steam heating system, a plurality of radiators; means including a boiler and suitable steam supply pipes for

supplying steam to each of said radiators; a return main communicating with said boiler for conducting the water of condensation from said radiators back to the boiler; a plurality of pipes communicating with said radiators and leading back to said return main and adapted to conduct the water of condensation from said radiators to said return main; and means whereby separate streams of the water of condensation from said radiators returned to said return main through said pipes are caused to flow within said main substantially parallel with but kept separate from one another throughout an appreciable distance before they are permitted to mingle and form a single stream, said means being located below the level of water in said return main.

5. In a low pressure steam heating system, a plurality of radiators; means including a boiler and suitable steam supply pipes for supplying steam to each of said radiators; a plurality of pipes communicating with said radiators for conducting the water of condensation from said radiators toward said boiler; means whereby separate streams of the water of condensation flowing in said pipes are caused to flow substantially parallel with but kept separate from one another throughout an appreciable distance and are then permitted to mingle and form a single stream, said means being located below the level of water in said boiler; and means communicating with said boiler and adapted to receive and conduct the resulting single stream of the water of condensation back to the boiler.

6. In a low pressure steam heating system, a boiler having a suitable steam supply main for supplying steam to the system; a return main communicating with said boiler for conducting water resulting from the condensation of steam in the system back to the boiler; and a plurality of pipes communicating with separate portions of the system and leading back to said return main and adapted to conduct the water thus produced from separate portions of the system back to said return main, said pipes discharging thereinto below the level of water in said boiler and one of said pipes being continued within said main toward the boiler and beyond the discharge orifice of another of said pipes, whereby separate streams of water returned to said return main through said pipes are caused to flow within said main substantially parallel with but kept separate from one another throughout an appreciable distance before they are permitted to mingle and form a single stream.

from one another throughout an appreciable distance before they are permitted to mingle and form a single stream.

7. In a low pressure steam heating system, a plurality of radiators; means including a boiler and suitable steam supply pipes for supplying steam to each of said radiators; a single return main communicating with said boiler for conducting water resulting from the condensation of steam in the system back to the boiler; and a plurality of pipes communicating with separate portions of the system and leading back to said return main and adapted to conduct the water thus produced from separate portions of the system back to said return main, said pipes discharging thereinto below the level of water in said boiler and one of said pipes being continued within said main toward the boiler and beyond the discharge orifice of another of said pipes, whereby separate streams of water returned to said return main through said pipes are caused to flow within said main substantially parallel with but kept separate from one another throughout an appreciable distance before they are permitted to mingle and form a single stream.

8. In a low pressure steam heating system, a plurality of radiators; means including a boiler and suitable steam supply pipes for supplying steam to each of said radiators; a return main communicating with said boiler for conducting the water of condensation from said radiators back to the boiler; and a plurality of pipes communicating with said radiators and leading back to said return main and adapted to conduct the water of condensation from said radiators back to said return main, said pipes discharging thereinto below the level of water in said boiler and one of said pipes being continued within said main toward the boiler and beyond the discharge orifice of another of said pipes, whereby separate streams of water of condensation from said radiators returned to said return main through said pipes are caused to flow within said main substantially parallel with but kept separate from one another throughout an appreciable distance before they are permitted to mingle and form a single stream.

This specification signed and witnessed this 29th day of May A. D. 1909.

JOHN G. MIDGLEY.

In the presence of—

E. V. SIMPSON,
GRACE G. SUTHERLAND.