Dec. 4, 1934. J. L. CABLE 1,983,120

HUMIDIFYING RADIATOR

Filed Dec. 26, 1930 2 Sheets-Sheet 1

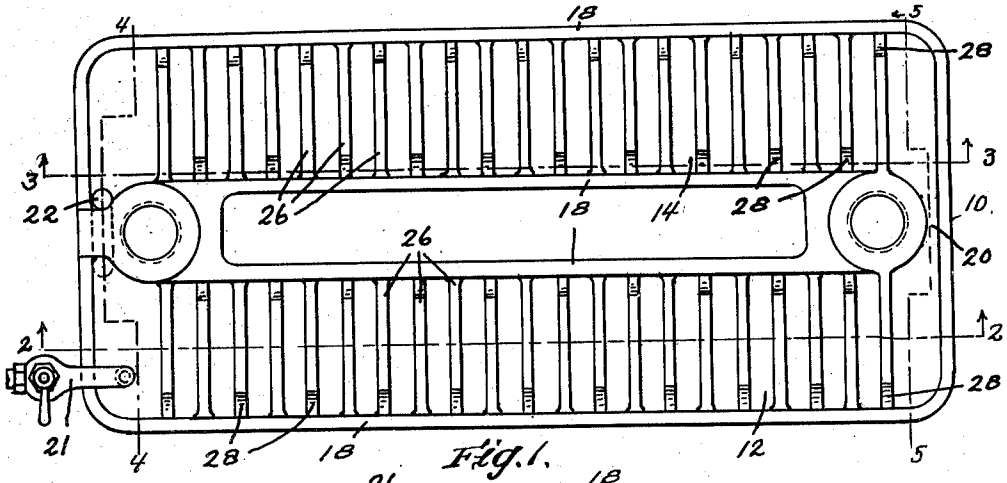

Fig. 1.

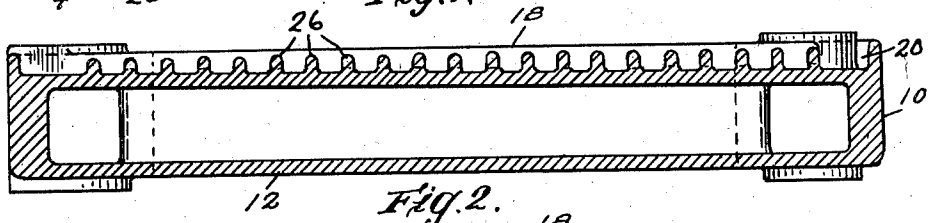

Fig. 2.

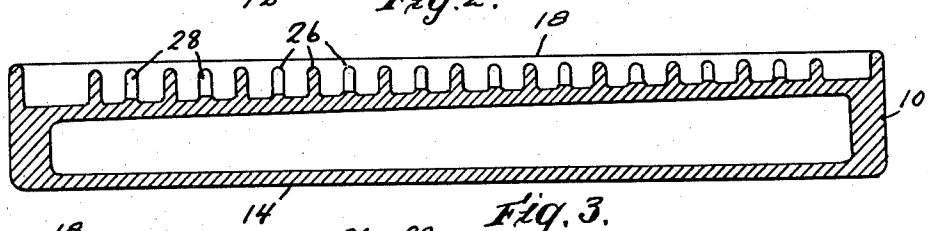

Fig. 3.

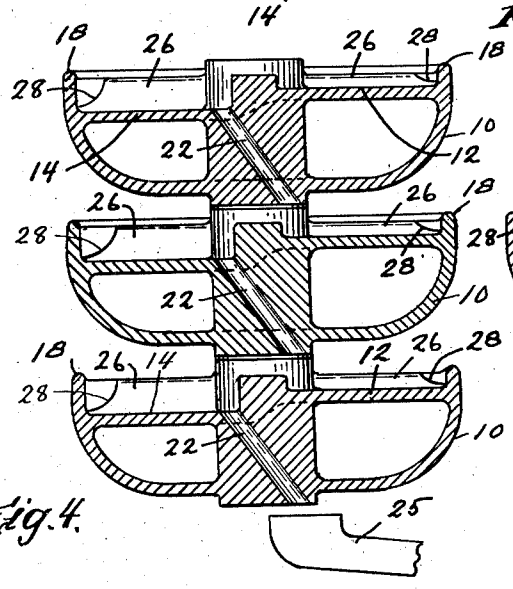

Fig. 4.

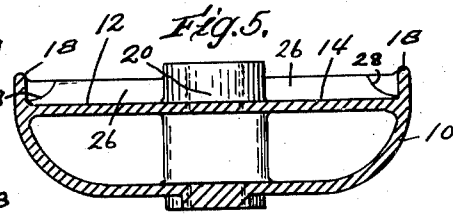

Fig. 5.

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HUMIDIFYING RADIATOR

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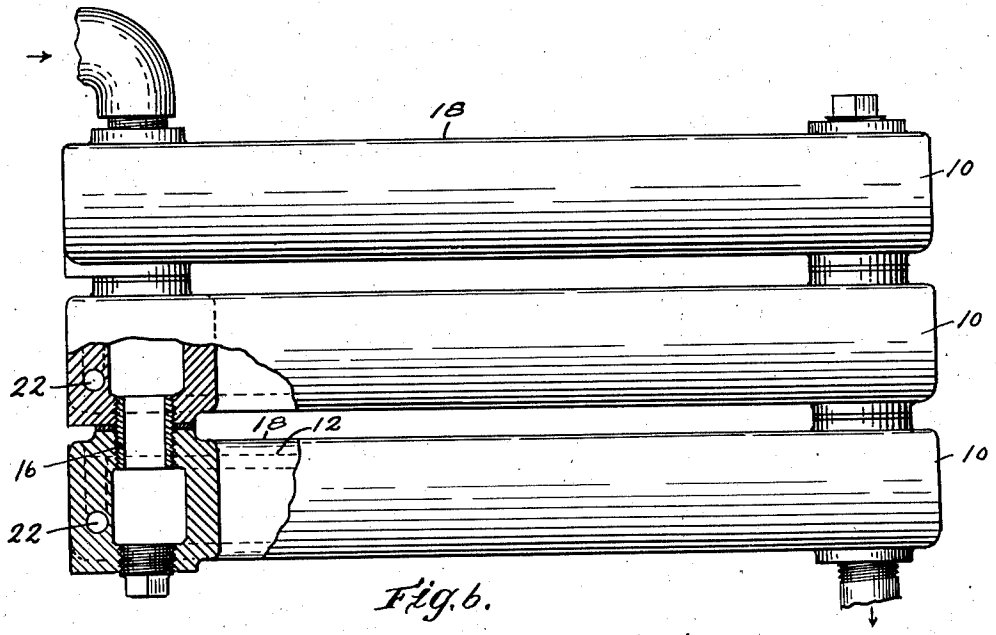

Fig. 6.

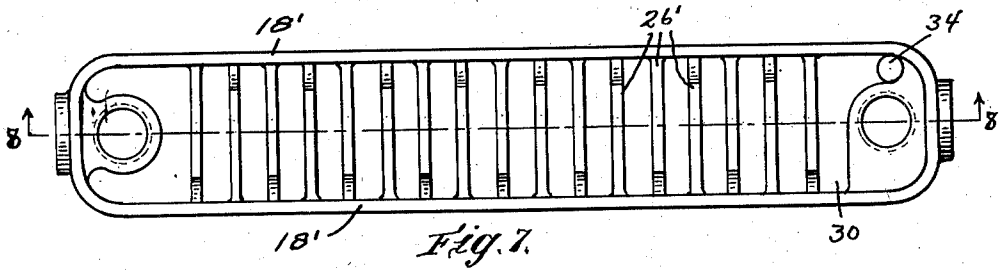

Fig. 7.

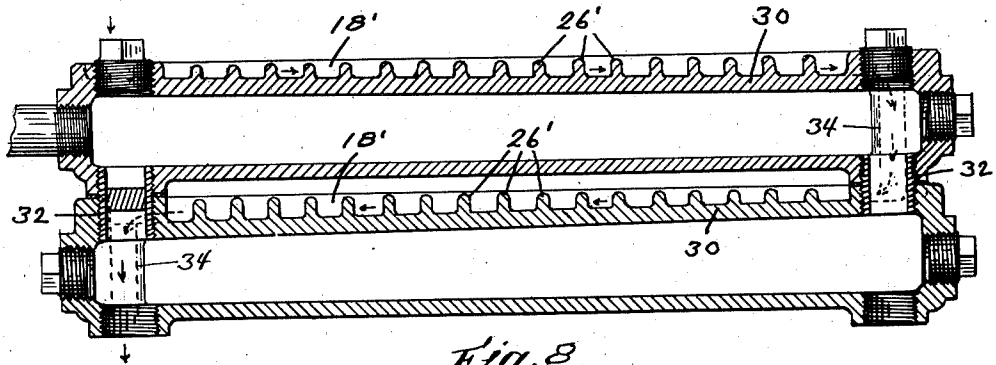

Fig. 8.

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UNITED STATES PATENT OFFICE

1,983,120

HUMIDIFYING RADIATOR

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Application December 26, 1930, Serial No. 504,698

18 Claims. (Cl. 257—179)

This invention relates to that type of humidifiers in which the sections of a radiator are provided with means for holding the water to be evaporated directly thereon.

Devices of this type which have been placed on the market and found to be reasonably efficient, have comprised a series of horizontally disposed heating sections on the upper sides of which a trough is provided for retaining the water to be evaporated, each section being provided with an overflow passage permitting the water from one trough to overflow into the trough below. While devices of this type are effective in causing the evaporation of the water supplied to these troughs, continued use has demonstrated that sediment collects in the bottoms of these troughs to an objectionable extent, and on account of the location and other conditions it is difficult and expensive to remove the sediment thus deposited. Also evaporation does not take place at as rapid a rate as may be desired.

The objects of my invention are to provide a humidifying radiator of the type above referred to in which the difficulties due to the depositing of sediment in other devices of this character may be avoided, and with which sediment, if deposited on the sections, may be readily removed. Also to provide a construction which will cause the evaporation of a maximum quantity of water for a certain temperature of the sections without causing the formation of steam.

I accomplish these and other objects of my invention by providing a series of heating sections, forming a radiator unit, having their top sides declining from end to end, and connected so that water delivered at one end of the top section will flow down the same to the opposite end and then be delivered to the other sections in succession, the flow on each section being through a tortuous path so as to cause a substantially increased tendency for the water to become evaporated, as compared with the more stagnate conditions of the water in prior constructions, the arrangement being such that the surface of all the sections may be readily cleaned by flushing.

For a more complete disclosure of the invention reference is now made to the following specification, in connection with the accompanying drawings in which:

Fig. 1 is a top plan view of a radiator section showing a preferred embodiment of my invention.

Figs. 2, 3, 4 and 5 are sectional views on lines 2—2, 3—3, 4—4 and 5—5, respectively of Fig. 1.

Fig. 6 is a side elevation, partly broken away, of a complete radiator embodying the invention.

Fig. 7 is a plan view of a modified form of the invention.

Fig. 8 is a sectional view at line 8—8 of Fig. 7.

Referring to Figs. 1 to 6 of the drawings, the complete radiator comprises a series of duplicate sections 10, the number of which is immaterial and may be varied as desired. Each section 10 comprises two hollow, parallel, heating members 12 and 14, which are formed integrally at their adjacent ends, an open space being provided between their adjacent sides, and said members being in open communication with each other at their adjacent ends as in a common form of radiator section. The end portions are also provided with opposite openings to permit connection with adjacent sections at each end by ordinary connecting nipples 16, as shown in Fig. 6, a raised boss being provided about each nipple opening, which acts to space the sections from each other to the desired extent.

The top side of each section member is horizontal transversely, and is provided with a raised edge portion 18 at each side and end forming a trough on the top side of each member which extends throughout the length thereof. The top surface of the section member 12 is formed to decline from the left to the right hand end of the section, as shown in Fig. 2, and the top surface of the member 14 is formed to decline from the right to the left hand end of the section, as shown in Fig. 3, the arrangement being such that the level of the top side of member 12 at its right or lower end is at, or slightly above the level of the top side of the member 14 at its right or upper end, these portions being connected by a passage 20, as shown in Fig. 5, so that water introduced to the left, or upper end of member 12, as from a faucet 21, will flow down the top side of the member to the lower end thereof, then through the passage 20 to the upper end of the member 14 and then down the top side of the latter to the lower or left end thereof. A passage 22 is formed in the left end of the section which leads from the lowest point in the top surface of the member 14 and extends obliquely downward therethrough, so that it opens directly over the upper end of the section member 12 directly beneath, as shown in Fig. 4.

Assuming, therefore, that a stream of water, as indicated by faucet 21, is discharged into the trough of the top section at the left, or upper end of the member 12, the water will flow down the member 12 thereof, then down the member 14, then through passage 22 to the corresponding starting point of the next section below, from which point the flow follows the same course as before and this flow will continue on each section until the water is discharged from the passage 22 of the bottom section into a waste pipe 25, as indicated in Fig. 4.

I further provide the top surface of each section member with a series of transversely disposed ribs 26, which are of somewhat less height than the side ribs 18, and are reduced in height at alternate opposite ends to within a short distance

of the level of the top surface, to provide passages 28, so that water delivered to the upper end of the top side of any member will be caused to flow transversely of the member, in one direction until it reaches the passage 28, at one side, then it will encounter the next rib and flow transversely in the opposite direction until it flows through the next passage 28 at the opposite side. The water will thus follow a tortuous course as it flows down each section member, but a certain amount of water will be retained by each rib, which is dependent on the height of the rib at the passage 28.

In use therefore each section will be heated with hot water or steam, and water for evaporation will be admitted in a small stream from faucet 21 to the upper section as before described. The flow from the faucet will be in sufficient volume to fill the space between each rib to the level of the bottom of the outlet passage 28, so that the entire top surface of each section member will be covered with water, and, as this water will be heated to the temperature of the heating fluid, rapid evaporation will be caused and as the water will be constantly disturbed as it flows, the rapidity of evaporation will be increased as compared with the rate of evaporation which would take place if the water was practically stagnant. As the ribs will be heated there will be no loss of evaporating surface due to their presence.

The flow of water admitted at the faucet 21 will be gaged according to the rate of evaporation, so that, under normal conditions, the quantity of water which will be discharged into the waste pipe 25 will be inconsiderable. If, however, it should be desired to flush out the channels on all the sections, it will be merely necessary to open the faucet sufficiently to cause a strong flow of water on the sections, so that sediment which may have collected on their top surfaces will be washed away to the discharge pipe.

While the construction is designed to be such that, when the sections are held in a horizontal position, the top surfaces will be held at the desired relative inclination to the horizontal, a slight variation of the sections from the horizontal will not substantially affect the evaporating action, also, while the top surfaces of the sections are designed to be held in a transversely horizontal position, a slight variation from this position will not cause the water to flow close to one side rib, as the cross ribs will prevent such action, and will not affect the tortuous flow, but will merely result in a slight increase in depth at one side of the section or the other, of the water which will be held back by the cross ribs.

In Figs. 7 and 8 a somewhat modified form of my invention is shown, which may be employed when only a narrow space is available for the radiator.

In this form each section 30 consists of a single member and the sections are arranged one over the other and connected by nipples 32 at their ends in substantially the manner before described. The top surfaces of the sections are arranged to decline alternately in opposite directions, so that the flow, for example, will be from left to right on the top section and from right to left on the next, and so on, a vertical passage as 34 being extended down through each section from the lower end of the top side, so that it opens directly over the upper end of the top side of the next section below. The construction of the top side of each section is identical to that of the separate section members before described, being similarly provided with side ribs 18′ and cross ribs 26′, so that water delivered to the upper end of one section will flow down the same in a tortuous path and be delivered to the next section below, and then will flow in the opposite direction in a similar manner. The evaporating action will be as efficient as in the construction previously described.

Other arrangements of the heating members may be employed, but those hereinbefore described are believed to be the most practical of which I am aware.

I claim:

1. A humidifying radiator comprising a horizontally disposed heating section composed of two members arranged side by side and connected at their adjacent ends, each of said members having its top surface arranged to decline from one end to the other, with each declining in the opposite direction to the other, the lower end of the top surface of one member being disposed at the level of the higher end of the other and connected thereto to permit gravity flow from one to the other.

2. A humidifying radiator comprising a series of horizontally disposed heating sections arranged one above another and connected at their adjacent ends, each section being composed of two members arranged side by side, and each member having its top surface arranged to decline from one end to the other, the declination of the members of each section being in opposite directions and the lower end of the top surface of one member of the section being disposed at the level of the higher end of the other and connected thereto, to permit gravity flow from one to the other, and each section having a passage leading downwardly from the end of the top surface of lowest elevation and opening to the top surface of highest elevation of the next section below.

3. A humidifying radiator comprising a series of elongated, horizontally disposed, internally connected heating members, each of said members having a transversely horizontal top surface arranged to decline from one end to the other and side ribs projecting above said surface to retain water flowing down the same and cross ribs on said top surface arranged in parallelism each to the other and extending alternately from said side ribs and each terminating adjacent the opposite side ribs, whereby water intercepted by each cross rib will be caused to flow horizontally across said surface before it flows downward and is intercepted by the next cross rib below.

4. A humidifying radiator comprising a series of elongated, horizontally disposed, internally connected heating members, each of said members having a transversely horizontal top surface arranged to decline from one end to the other and side ribs projecting above said surface to retain water flowing down the same, and suitably spaced cross ribs extending in parallelism each to the other transversely on said top surface from one side rib to the other and having openings above said surface and adjacent the side ribs alternately, to deflect water overflowing from one cross rib to the next in a tortuous course.

5. A hollow radiator section having its top wall shaped to present a recessed water course bounded at its sides and ends by an upwardly projecting marginal wall, said water course having an outlet at one end flush with its bottom

wall and means for introducing water into the opposite end of the water course to maintain said bottom wall covered by a thin film of water constantly drained through the outlet.

6. A hollow radiator section having its top wall shaped to provide a recessed water course bounded at its sides and ends by a continuously upwardly projecting marginal wall, said water course having a downward slope towards one end and being provided at said end with an outlet flush with the bottom wall of the water course, said outlet extending through the radiator section to an opening in the bottom wall of said section and means for introducing water into the opposite end of the water course to maintain the bottom wall covered by a thin film of water constantly draining through the outlet.

7. A hollow radiator section having a recessed water course at its upper surface, a wall structure dividing the water course into non-communicating parallel flow channels, an outlet at one end of each channel flush with the bottom wall thereof and means for introducing water into the opposite end of each channel to maintain the bottom wall of the channel covered by a thin film of water flowing in the direction of the outlet.

8. A hollow radiator section having a recessed water course at its upper surface, a wall dividing the water course into parallel flow channels communicating at one end of said wall, one of said channels having an outlet at one end flush with its bottom wall and means for introducing water into the corresponding end of the remaining channel so that a thin film of water is caused to flow in one direction along the last mentioned channel and then in the reverse direction along the first mentioned channel before escaping through the outlet.

9. A radiator section having a recessed water course at its upper surface, said water course presenting a flow channel sloping downwardly towards one end of the section and having its lower end communicating with the upper end of a parallel reverse flow channel sloping downwardly towards the opposite end of said section, means for introducing water into the upper end of the first mentioned channel and an outlet located at the lower end of the second mentioned channel flush with the bottom wall thereof.

10. A humidifying radiator comprising hollow radiator sections arranged one above the other, each section having a recessed water course at its upper surface, said water course including a flow channel sloping downwardly towards one end of the section and communicating at its lower end with the upper end of a parallel reverse flow channel sloping downwardly towards the opposite end of said section, said second mentioned channel having an outlet at its lower end flush with the bottom wall thereof, said sections being arranged so that the outlet formed at the lower end of the second mentioned channel of each section delivers to the upper end of the first mentioned channel of the next lower section, and means for maintaining a thin film of water flowing along the channels of each section in the direction of the outlet.

11. A radiator comprising a plurality of superimposed radiator sections each having its top wall shaped to present a water course bounded at the sides and ends by a continuous upwardly projecting marginal wall, an internal water chamber formed in the interior of each section below one end of the overlying water course, there being an opening in the top wall of the section placing the water chamber in communication with the overlying water course and a second opening in the bottom wall of the section affording an outlet from said chamber, said sections being relatively arranged so that water draining through the internal water chamber of one section is introduced into one end of the water course of the next lower section and means for introducing water into the water course of the uppermost section at the end remote from the water draining chamber formed therein.

12. A humidifier comprising a plurality of spaced horizontally arranged hollow heating sections connected together to receive a heating medium, said sections being formed with tray-like depressions in their upper surfaces to receive a humidifying medium, said sections also being provided with intercommunicating passages through the depressed portions, the axes of said passages being inclined from the vertical axis of the humidifier.

13. A humidifier comprising a plurality of spaced horizontally arranged hollow heating sections connected together to receive a heating medium, said sections being formed with tray-like depressions in their upper surfaces to receive a humidifying medium, said sections also being provided with intercommunicating passages through the depressed portions, said passages being defined in part by two parallel walls inclined from the vertical axis of the humidifier.

14. A humidifier comprising a plurality of vertically spaced horizontally arranged hollow heating sections connected together to receive a heating medium and formed with tray-like depressions in their upper surfaces to receive a humidifying medium; and a passage through one section arranged with its axis inclined to the vertical axis of the humidifier and having its inlet in the depression of the upper one of said sections.

15. A hollow radiator section having a top water evaporating surface formed to provide a gradually descending water course having an inlet at its upper end and an outlet at its lower end, and a drain conduit at the lower side of said section arranged to deliver water from said outlet to the next lower section when a plurality of said sections are arranged one above the other in vertical alignment.

16. A hollow radiator section having its top wall shaped to provide a recessed water course presenting communicating channel portions sloping downwardly towards opposite edges of the section.

17. A hollow radiator section having its top wall shaped to provide a recessed water course presenting communicating channel portions arranged to cause the water to alternately flow in opposite directions along the upper surface of the section.

18. In a device of the character described, comprising a plurality of spaced and superposed heating sections connected to one another for circulating a heating medium therethrough, said heating sections having exposed recessed portions for containing a humidifying medium, and inclined spillways extending downwardly from said sections and lying within the vertical planes bounding the sides of said sections over which the excess of humidifying medium of one section flows to the section next below.

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