June 19, 1934. E. SCHÜTZ 1,963,506

RADIATOR

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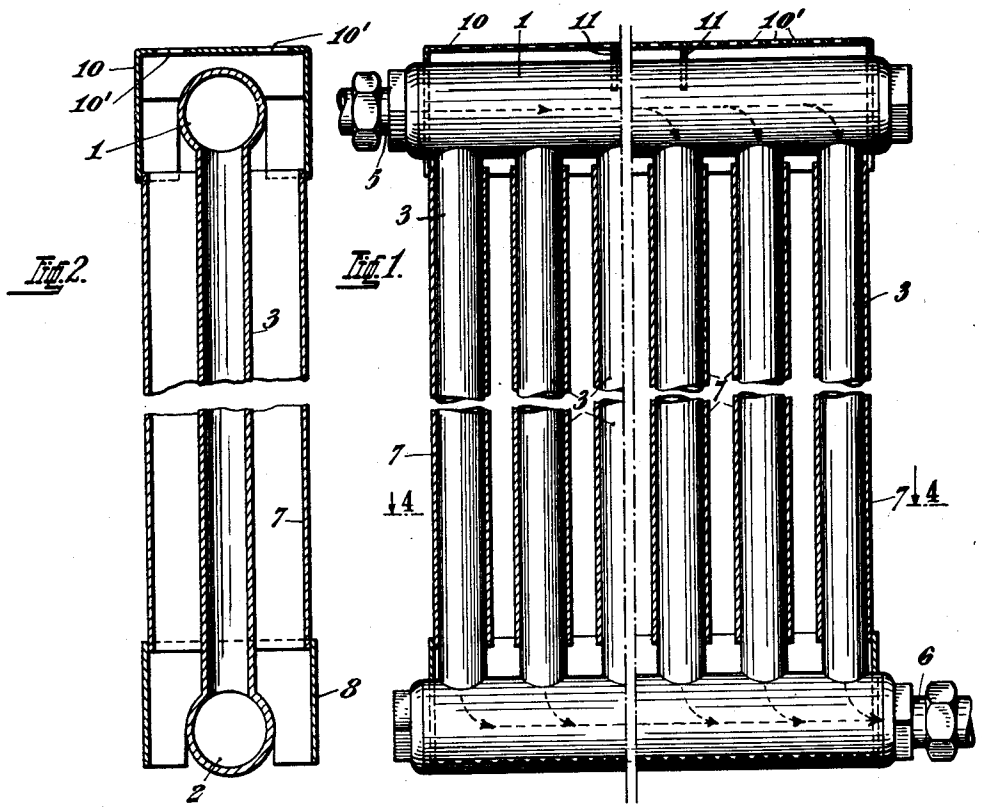
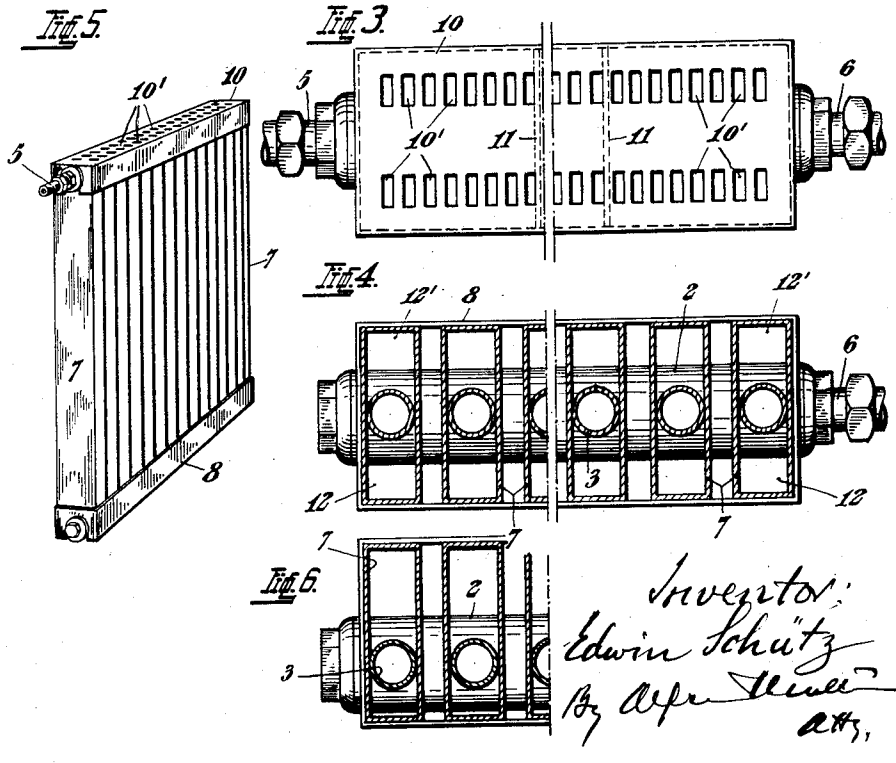


Fig. 2.

Fig. 1.



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RADIATOR

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8 Claims. (Cl. 257—154)

My invention relates to radiators of the kind comprising indirectly heated heat-exchange surfaces, and has for one of its objects to provide an improved construction which shall be more efficient than those known heretofore.

To this end, in a radiator of the kind described, according to the invention, the heating elements conducting the heating medium are arranged in the middle of heat-exchange cases with which they are in direct metallic connection along their entire length and divide the cases into chimney-like air channels. In this way a double heating effect is produced as described hereinafter.

According to a feature of the invention, the said cases open below and above respectively into a hollow base and a header having a removable cover.

Preferably, the said cases extend transversely of the header, and from each two chimneys at opposite sides of an allotted heating element, which are approximately the same length as the heating elements, and are so arranged that between the cases a free space is left through which the air to be heated can flow.

Conveniently, the end pieces or headers formed as containers are surrounded each by a box-like housing to which the lower and upper ends of the said cases are connected and form therewith an envelope or covering which increases the suction action of the chimneys.

According to another feature of the invention, the heat-exchange cases are of rectangular cross-section and are arranged so spaced apart that the free space between them assures an approximately uniform velocity of the air to be heated therein.

The heating elements and the heat-exchanges may consist of a metal of high thermal conductivity, the former preferably being of copper.

One embodiment of the invention is diagrammatically illustrated by way of example in the accompanying drawing, wherein

Figure 1 is a side elevation, partly in section, showing one form of radiator according to the invention,

Figure 2 is a vertical section through the same,

Figure 3 is a top plan view,

Figure 4 is a horizontal section taken on the line 4—4 in Figure 1, and

Figure 5 is a perspective view of the radiator drawn to a smaller scale than Figures 1 to 4.

Fig. 6 is a horizontal section of a modification.

Like reference characters designate like parts throughout the several views.

Referring to the drawing, an upper header 1 and a lower header 2 of the radiator are connected by tubular heating elements 3 which convey the heating medium and are composed of a metal of high thermal conductivity, e. g. copper, for providing a rapid transmission of heat. The headers 1, 2 have in addition the usual pipe connections 5 and 6, respectively, which when the radiator is connected to a hot-water pipe, enable the hot water to flow in the direction indicated by arrows shown by broken lines.

Each heating element 3 is surrounded by a heat-exchange case 7 of rectangular contour, in the middle of which it is situated, or approximately so. These cases are so arranged that the longer sides of each rectangle lie transversely of the direction of length of the radiator. The cases 7 are connected with one another below by a box-like hollow socket or base 8 supported on the lower header 2. The upper end of the casing formed in sections in this manner is closed by a box-like removable cover 10 which has at the top air outlets 10′ and is supported by its ends and ribs 11 between the latter on the upper header 1. Owing to this construction of the outer casing so-called chimneys 12 and 12′ for the circulation of air are formed at either side of each heating element 3. The cases 7 are in direct-thermal connection with the heating elements along substantially their entire length and are thereby heated indirectly by the heating medium.

In this way a double heating effect of the radiator is produced, firstly by the outer faces of the cases 7 by heat exchange to the surrounding air, and secondly by columns of air that rise in the said chimneys and flow along the heating elements and the inner faces of the heat-exchange cases which may also be composed of a metal of high thermal conductivity in order to promote heat transmission.

As is shown in Fig. 6, the heating elements 3 are situated nearer to one end of the heat-exchange cases 7 than to the opposite side of them. This particular arrangement of the heating elements in the cases 7 effects a stronger heating of the former side of the cases than of the opposite side. If the radiator is positioned close to a wall, or in the same with the end of the cases 7 less heated opposite the wall, the loss of heat by radiation is smaller than where the heating elements are located in the middle of the heat-exchange cases.

The cases 7 may be of any other convenient form and this possibility enables the radiator to be shaped corresponding to its architectural environment, both as regards the room in which

it is placed and any furniture that may be present. For this purpose, the base and cover of the casing may also be of any desired shape.

One advantage of the improved construction of radiator is that after the removal of the cover, the radiator and the inner walls of the casing can be readily cleaned. Preferably, the casing is also made of copper in order to adapt its color to its surroundings by suitable surface treatment, as, for example, by chemical action.

The radiator of course may also be used with other heating media than water, as, for example, steam.

Tests have shown that the described radiator made of copper and delivering the same amount of heat to the surrounding air occupies considerably less space and weighs less than a cast-iron radiator as constructed heretofore. In addition, the volumetric space for the heating medium of the copper radiator is much less than that of the cast-iron radiator, so that the former is capable, under otherwise like conditions, of heating up more rapidly.

The following comparative numerical results have been obtained.

Whereas when heating up a cast-iron radiator constant temperatures were obtained only after 50 minutes in the inflow and outflow pipes, they were attained in the described copper radiator after only 22 minutes. With the same cubic contents the copper radiator has about 52% more heat transmission than the cast-iron radiator. With the same delivery of heat a cast-iron radiator has 213% more weight than the improved copper radiator and 86% more cubic content.

I claim:

1. In a radiator, in combination with lower and upper headers, and a plurality of tubular heating elements connecting the same, a plurality of heat-exchange cases each surrounding a heating element, said heating elements being in direct metallic connection with their heat exchange cases along their entire length and dividing them into two chimney-like compartments, and hollow members connecting the upper and lower ends of said heat exchange cases being in detachable engagement therewith.

2. In a radiator, in combination with lower and upper headers, and a plurality of tubular heating elements connecting the same, a hollow base on the lower header, a hollow head piece at the upper header, and a plurality of heat-exchange cases each surrounding a tubular heating element and opening into said base and said head piece, said heating elements each being in direct metallic contact with its allotted case along its entire length and dividing it into two air chambers each constituting a chimney.

3. In a radiator, in combination with upper and lower headers, and a plurality of tubular heating elements connecting the same, a hollow base on the lower header, a hollow head piece mounted on the upper header, and a plurality of heat-exchange cases each surrounding a heating element and opening into said base and said head piece, said heating elements being in direct metallic contact with their surrounding case along their entire length and dividing them into two air chambers each constituting a chimney, said cases and heating elements being substantially equal in length and so arranged as to leave a free space between adjacent cases for the flow of air to be heated.

4. In a radiator, in combination with lower and upper headers, and a plurality of tubular heating elements connecting the same, a casing therefor comprising a box-like base part embracing the lower header, a box-like head part mounted on and embracing the upper header, and a plurality of tubular cases each surrounding a heating element and connecting said base and head part, each of said heating elements being in direct metallic contact with its surrounding case along its entire length and dividing it into two air chambers each constituting a chimney.

5. In a radiator, in combination with upper and lower headers, and a plurality of tubular heating elements connecting the same, a hollow base part on the lower header, a hollow head part on the upper header, and a plurality of tubular cases each of rectangular cross-section and each surrounding a heating element and each placing said base and head part into open communication one with the other, each of said heating elements being in direct metallic contact with its surrounding case and dividing it into air-chambers constituting each a chimney, said cases being so arranged spaced apart in the direction of length of the headers that said free spaces between them permits an approximately uniform velocity of flow of the air to be heated rising therein.

6. A combination of parts as set forth in claim 2, characterized in that said base and head piece as well as the said cases consist of copper having a surface treatment adapted to suit its environment.

7. A radiator comprising in combination lower and upper headers, a plurality of tubular copper heating elements connecting the same, a copper box-like base embracing the lower header, a copper box-like head piece surrounding the upper header and having a removable cover, and a plurality of copper tubular cases each of rectangular cross-section and each surrounding a heating element and each connecting said base and head piece each heating element being in direct metallic contact with its surrounding case along its entire length and dividing it into two air-chambers constituting chimneys, which cases are spaced apart in the direction of length of the headers and have said chimneys situated at opposite sides of the heating elements with the longer side of each rectangle lying transversely of the said direction of length.

8. In combination with a radiator comprising upper and lower headers and a plurality of tubular heating elements connecting the same, a plurality of tubular cases each enclosing a related heating element, said cases being of greater cross sectional area than said heating elements to provide air spaces between the cases and the heating elements, each case being in direct contact throughout its length with its related heating element, said cases being spaced apart to provide air spaces therebetween, said cases being open at their upper and lower ends, and a hollow head piece enclosing the upper header and the upper ends of said cases, said head piece having air egress openings therein.

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