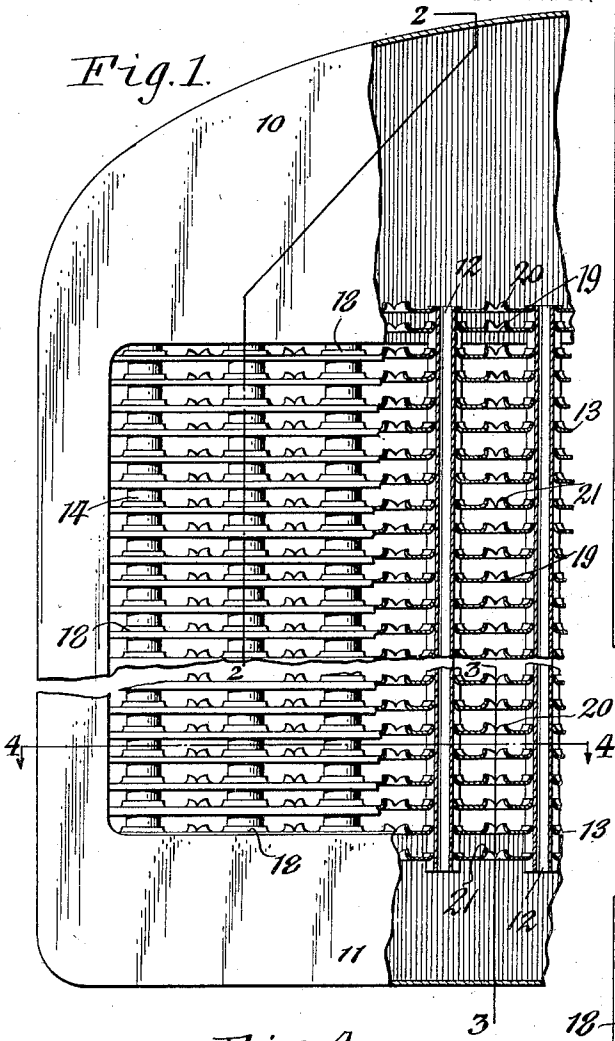
July 22, 1924. 1,502,301

J. M. FEDDERS

RADIATOR

Filed Sept. 6, 1922

Fig. 1.



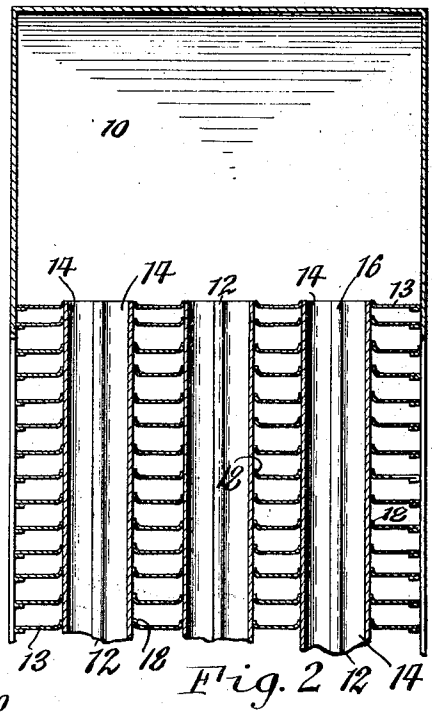
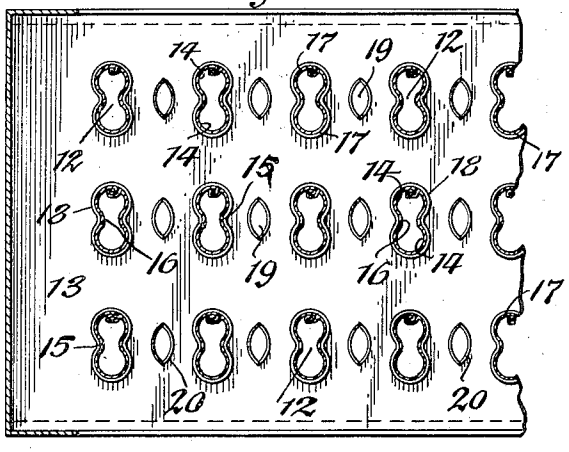


Fig. 2.

Fig. 4.



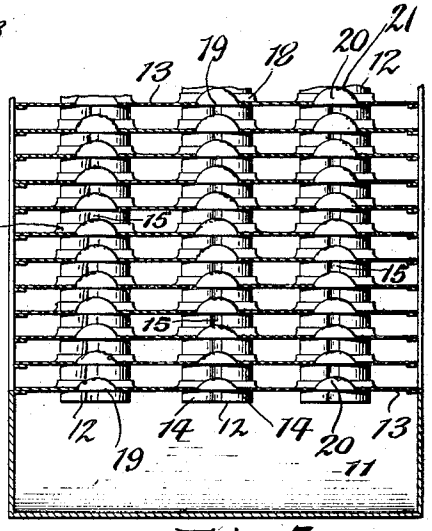


Fig. 3.

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Patented July 22, 1924. 1,502,301

UNITED STATES PATENT OFFICE.

JOHN M. FEDDERS, OF BUFFALO, NEW YORK, ASSIGNOR TO FEDDERS MANUFACTURING COMPANY, INC., OF BUFFALO, NEW YORK, A CORPORATION OF NEW YORK.

RADIATOR.

Application filed September 6, 1922. Serial No. 586,520.

To all whom it may concern:

Be it known that I, JOHN M. FEDDERS, a citizen of the United States, residing in Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Radiators, of which the following is a specification.

This invention relates to a radiator which is more particularly intended for use in cooling the water of an automobile engine, although the same may also be used for other purposes.

The primary object of this invention is to so construct the tubes which conduct the water so that the same are capable of contraction and expansion and will not burst, if at any time the water therein should freeze, thereby preventing the radiator from leaking as frequently occurs in the case of the radiators now in common use.

A further object of this invention is to provide air openings in the radiating fins which are so constructed as to permit a thorough cross circulation of air between the several water tubes and still not interfere with the free flow of the same through the radiator, thereby securing an increased cooling efficiency.

In the accompanying drawings:

Figure 1 is a fragmentary front elevation, partly in section, of a radiator embodying my improvements. Figures 2 and 3 are longitudinal sections, taken on lines 2—2, and 3—3, Fig. 1, respectively. Figure 4 is a horizontal section taken on line 4—4, Fig. 1.

In the following description the same characters of reference indicate like parts in the several figures of the drawings.

The main elements of the radiator consist of an upper water box or header 10, a lower water box or header 11, a plurality of upright water tubes 12 arranged parallel and spaced a suitable distance apart and each communicating at its upper and lower ends with the upper and lower water boxes, and a plurality of horizontal radiating fins or plates 13 arranged in a vertical row but spaced from one another and each penetrated by the several water tubes. It is to be understood that the headers or water boxes are connected with the water jacket or other parts of the water circulating system of the engine in any suitable and well known manner. The several members just enumerated are constructed of sheet metal, preferably thin copper, brass or the like.

Each of the water tubes is of oblong form in cross section and provided in its walls with one or more longitudinal corrugations which will permit this tube to expand and contract and thereby prevent the same from bursting or cracking and leaking in the event that the water should become accidentally frozen therein during cold weather.

In the preferred form of the water tube this is accomplished by constructiong the same so as to form two longitudinal cylinders 14, 14 at opposite narrow edges which have the opposing parts of their circles intersecting or overlapping each other in substantially the from of a figure 8, dumbell, or hour glass. A tube of this construction has the outer surfaces of its wide side walls indented by two longitudinal grooves 15 which in effect produce corrugations on this tube whereby the same is permitted to expand and contract within certain limits without rupturing the tube or destroying the cross-sectional contour of the same. In the event that the water in these tubes should freeze in winter time or cold weather, the walls of the same are free to expand and when the ice has again melted, the walls of the tube, due to their resilience will again contract and resume their normal shape without injuring the tube or rendering the same leaky and without distorting and disfiguring the tube, thereby preserving the appearance of the tube and rendering the same proof against damage by freezing of the water in the same. The junctions between two cylindrical edge sections of each tube are preferably rounded, as shown at 16, in Fig. 4, so that no sharp turns are present in the tube and thus prevent fracture of the same if the same should be expanded and contracted frequently due to repeated freezing of the water in the same.

Each of the radiating fins or plates is provided with a plurality of tube openings, through which the several tubes extend, each of these openings consisting of two circular parts 17, 17 which intersect or overlap each other so that the same corresponds to the cross-sectional form of the respective tube. The latter is fitted into a vertical series of tube openings in the several fins so as to form a firm and tight contact between the tube and fins and thus ensure the transmission of the heat from the water in the tube

to the fins and from the latter to the surrounding atmosphere and thus obtain the maximum cooling efficiency. The dimensions of the tube openings in the fins and the tubes adapted to enter these openings is such that the tubes have to be compressed slightly in order to get them into these openings which causes these tubes to exert a constant tendency to expand and maintain a good metallic contact with the fins or radiating plates and thus insure the best radiating efficiency. For the purpose of further insuring a good thermal contact between the several tubes and the radiating fins, the edge of each tube opening in the fins is provided with a collar 18 formed integrally with the respective fin, which collar engages the respective tube and may be additionally secured thereto by soldering or otherwise.

In order to cause the air passing through the space between the tubes to come more effectively in contact with the same, those portions of the fins between the tubes are provided with air distributing openings 19 and a baffle or deflecting flange 20 arranged around the edge of each of these openings. These baffles or deflectors are preferably produced by the metal which is displaced during the formation of the air openings and remain integrally connected with the fins.

In the preferred construction, these air openings and the baffles or deflectors are made of oblong form in a direction fore and aft of the radiator, and as shown in Fig. 4, the same are of almond shape. This formation of the baffles or deflectors causes the air upon passing rearwardly through the radiator to strike the deflectors and be diverted by the latter sidewise against the adjacent tubes and thus cause a greater quantity of the air to come into contact with the tubes, thereby increasing the radiating efficiency accordingly. The heat absorbing capacity of the baffles or deflectors is still further increased by making the edges of the baffles of irregular, jagged, raw or rough form, as shown at 21 in Figs. 1 and 3, which has a tendency to break up the streams of air and cause the same to take up an increased amount of heat.

This radiator aside from being very efficient in operation and also incapable of being destroyed or rendered inoperative by freezing has the further advantage in that it can be manufactured at low cost. This is due largely to the simplicity of the tools for making the various elements of the radiator.

I claim as my invention:

A radiator comprising a plurality of tubes, and radiating fins having a plurality of tube openings in which said tubes are fitted and a plurality of air openings between said tube openings, each of which is of almond shape with the major axis arranged fore and aft of the radiator, and a flange arranged around each of said air openings and consisting of the metal displaced from the fin by the formation of said air opening and having an irregular edge.

JOHN M. FEDDERS.