Apr. 3, 1923.

1,450,399.

M. WITTE.

RADIATOR.

FILED OCT. 11, 1920.

2 SHEETS—SHEET 1.

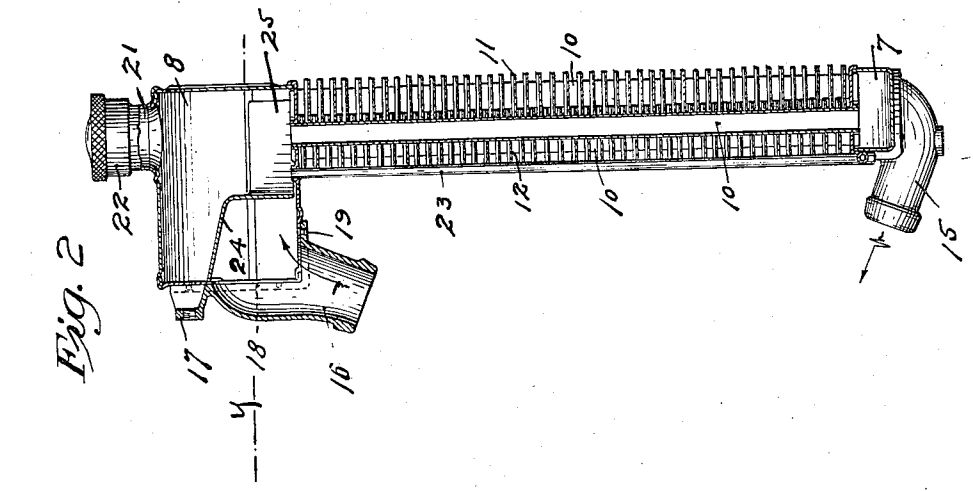


Fig. 2

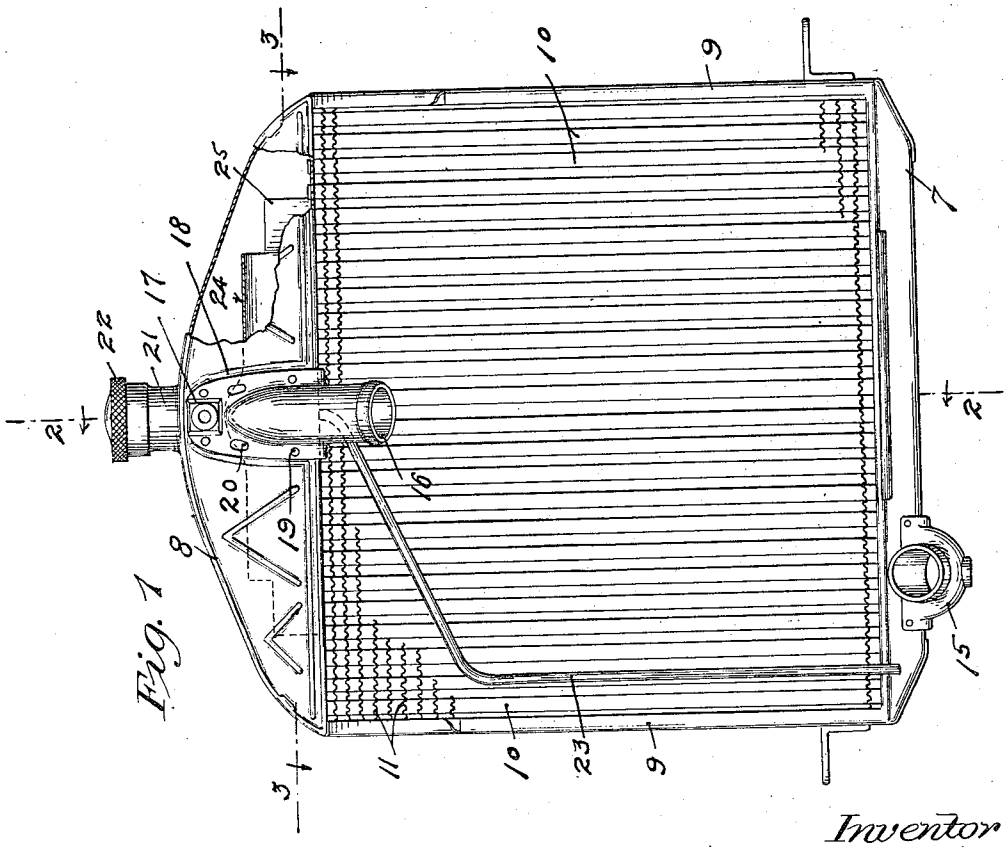


Fig. 1

Inventor
Meinhard Witte
By his Attorney
Harry D. Kilgore

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2 SHEETS—SHEET 2.

Fig. 3

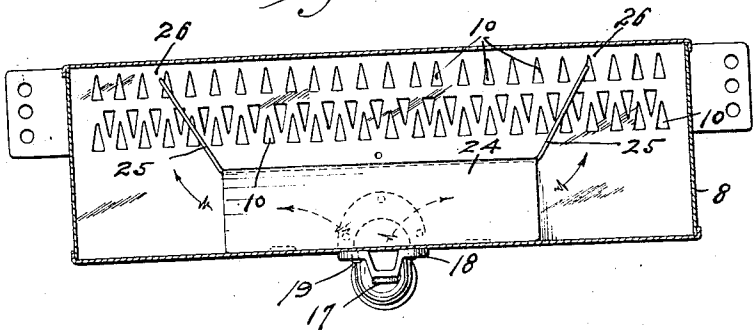


Fig. 4

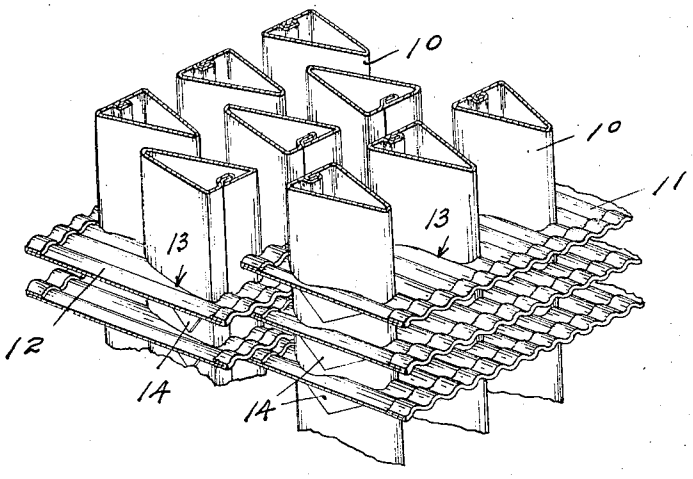


Fig. 5

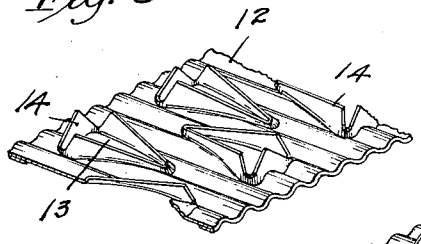
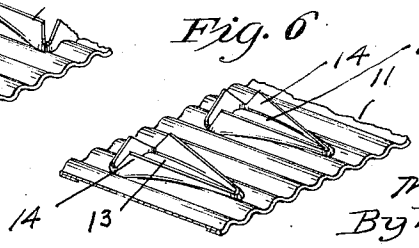


Fig. 6



Inventor,
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Patented Apr. 3, 1923. 1,450,399

UNITED STATES PATENT OFFICE.

MEINHARD WITTE, OF ST. PAUL, MINNESOTA.

RADIATOR.

Application filed October 11, 1920. Serial No. 416,083.

To all whom it may concern:

Be it known that I, MEINHARD WITTE, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Radiators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention relates to radiators for use in connection with internal combustion engines and is especially designed as an improvement on the radiator disclosed and broadly claimed in my pending United States application Serial Number 312,237, filed July 21, 1919. However, certain of the features of this invention are not limited to use in connection with the arrangement of radiator tubes disclosed and claimed in my said prior application, but are generally applicable to radiators having upper and lower tanks and connecting water tubes.

The present invention is illustrated in the acompanying drawings, wherein like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a rear elevation of the radiator, with some parts sectioned, some parts broken away and with some parts omitted;

Fig. 2 is a vertical section taken approximately on the line 2—2 of Fig. 1;

Fig. 3 is a horizontal section taken approximately on the line 3—3 of Fig 1;

Fig. 4 is a fragmentary perspective showing sections of the water tubes and portions of the radiating plates through which the tubes are passed; and

Figs. 5 and 6 are fragmentary perspectives showing sections, respectively, of the rear and front radiating plates.

The lower water tank of the radiator is indicated by the numeral 7 and the upper water tank is indicated by the numeral 8, said tanks being connected in the usual, or any suitable way, by a marginal frame 9. The construction so far described may be assumed to be that of an ordinary Ford radiator, but may be of any other type. The arrangement of water tubes here illustrated is broadly the same as in my prior application, but there is a minor but important improvement in the arrangement of these tubes, as will presently appear. In this preferred arrangement, there are three rows of water tubes 10 that are triangular in cross section and these tubes connect the upper tank 8 to the lower tank 7. Said tubes, at their upper ends, are passed through the bottom plate of the upper tank and, at their lower ends, are passed through the plate of the lower tank, and are secured thereto by water-tight joints formed by solder or the so-called "sweating" process. In this preferred arrangement, the front row of tubes and the rear row of tubes are set with their relatively sharp angles projecting forwardly. The intermediate row of tubes are set with their sharp angles projecting rearwardly and with their flat front sides set in line with the spaces between the front tubes, so that air, passing between the front tubes, will strike directly against said flat front surfaces.

As an improved feature not disclosed specifically in my prior application, I stagger the tubes of the front and intermediate row and extend the tubes of the intermediate row well into the spaces between the tubes of the rear row. This not only gives more compact arrangement of the tubes, but narrows the spaces between said tubes so that air, in passing between the same, will be brought into very intimate contact with the walls of said tubes, thus obtaining a maximum cooling efficiency of the air on the radiator.

To increase the radiating surface which conducts the heat from the hot water within the tubes, I provide the tubes with radiating plates or fins 11 and 12, of novel construction and arrangement. Here it may be stated that the tubes 10 and the radiating plates 11 and 12 are preferably of thin sheet brass, which has a high heat-conducting capacity and will not corrode.

The front radiating plates 11 are, in width, considerably greater than the cross section of a front tube 10 measured from front to rear, and the rear radiating plates 12 are, in width, considerably greater than the front to rear distance between the front portion of an intermediate tube and the rear portion of a rear tube. All of the radiating plates 11 and 12 are provided with tube passages 13 formed, not by removing metal from the plates, but by slitting the same

and then turning up the partially severed lips 14 in vertical positions, so that when the tubes are passed through said passages, 13, they will not only fit the same closely, but said lips 14 will be frictionally pressed into extended contact with the walls of said tubes. The lips 14 will be rigidly attached to the exterior of the tubes by a solder preferably applied by the well known "sweating" operation. Thus, the connections between the tubes and radiating plates will give large surface contact, so that there will be an extremely good heat-conducting connection made between the tubes and plates.

To make the radiating plates expansible and contractible to automatically adapt themselves to expansion and contraction of the tubes, and further to increase the radiating surfaces of said plates, the latter are preferably corrugated, as best shown in Figs. 4, 5 and 6. The radiating plates are quite closely spaced and applied at suitable intervals from upper to lower portions of the tubes and, preferably, the rear edges of the front plates 11 are lapped in contact with the front edges of the rear plates 12, but this latter feature is not essential.

The lower hose connection 15 is applied to the lower tank 7 in substantially the customary way, but the upper hose connection is of novel construction and is applied in a novel manner to the upper tank 8. Usually, the upper hose connection is applied to one portion of the upper tank, and a bracket for the connection of the radiator tie-rod is applied at another place, so that the upper tank, in service, is subjected to very considerable distorting strains. In accordance with one feature of my present invention, the upper hose-connecting inlet 16 and the radiator tie-rod anchoring bracket 17 are cast integral and the two structures are provided with a common angular flange 18 that fits against substantially the entire rear central plate of the upper tank 8 and extends partly under the bottom of said tank and is secured rigidly to said upper tank, both at rear, side and bottom, preferably by rivets and also by solder applied by the sweating operation. In Fig. 1, rivets are indicated by the numeral 19 and the numeral 20 indicates holes through which solder may be sweated. By reference to Figs. 1 and 2, it will be noted that the tie-rod bracket 17 is on the upper portion of the flange 18 and has a threaded hole through which a threaded end of the radiator tie-rod may be screwed.

Obviously, the combined upper hose-connecting inlet 16, the bracket 17 and flange 18 cover a considerable portion of the upper tank 8 and very greatly stiffen the same and, moreover, distribute the strains over a considerable portion of said tank. The upper tank 8 is shown as provided with the customary filling neck 21, with a removable cap 22. In Figs. 1 and 2, the numeral 23 indicates the usual overflow tube from the upper tank.

As an important feature of this invention, I provide, within the upper tank 8, a so-called circulation equalizing plate 24, the function of which is to cause approximately the same rate of flow of water downward through all of the water tubes of the several rows. As shown and as preferably designed, this circulation equalizing plate 24, at its upper edge, is soldered or otherwise rigidly secured to the back plate of the upper tank 8 approximately at the water level Y, see Fig. 2, and extends forward within said tank and then downward approximately to the bottom thereof and is formed with forwardly converging deflecting wings 25. These wings 25, at their upper edges, are preferably far below the water level Y, and, at their outer edges, terminate short of the front plate of the tank 8, so as to leave contracted but unobstructed water passages at 26. The body of the plate 24 forms a sort of a hood over the entrance passage from the upper hose connection 16. This hood extends far on each side of the said inlet passage, but is open at both extremities so that the incoming water can flow freely out of both ends of the hood. The waterflow out of the ends of the hood afforded by the plate 24 freely reaches the upper ends of the outside tubes 10 and flows over the wings 25 to the upper ends of the intermediate tubes. Also, the water flows around the ends of the wings and through the passages 26 to the inner tubes. The wings, therefore, retard the flow of the water to the intermediate tubes and cause the same to pass first toward the outer tubes.

In radiators wherein no provision is made for spreading out the water within the upper tank, the natural flow carries the water chiefly through the intermediate or inner tubes, or, in other words, the tubes that are nearest to the inlet connection, and, hence, the flow of water is not evenly distributed through the several tubes. Obviously, the most efficient radiation and cooling action will be produced only when the flow of the water is evenly distributed through all of the tubes. My improved arrangement of the so-called circulation equalizing plate approximates this ideal even distribution of the circulation through all of the tubes.

The efficiency of the radiator herein described has been demonstrated in actual practice, and the statements herein made as to the operation or functions performed are based on results actually obtained in the operation of the radiator.

Neither the upper hose connection or elbow nor the circulation-distributing plate in the upper water tank are herein claimed, but are made the subject-matter of divisional

applications, the one entitled "Upper hose connections for radiators," Serial No. 559,353, and the other entitled "Circulation-distributing plate," Serial No. 559,354, and both filed of date May 4, 1922.

What I claim is:

1. An automobile radiator comprising upper and lower tanks and staggered rows of tubes connecting the said tanks, one row of tubes having forwardly converging flat surfaces and the adjacent row of tubes having rearwardly converging flat surfaces, said converging surfaces of the tubes of the one row extending into the diverging spaces between the tubes of the other row, the opposing interlapped surfaces of the two rows of tubes being in parallel arrangement and affording air passages therebetween.

2. An automobile radiator comprising upper and lower tanks and three staggered rows of triangular tubes connecting said tanks, the front and rear rows of tubes having forwardly converging surfaces and the intermediate row of tubes having rearwardly converging surfaces that extend into the forwardly diverging spaces between said rear row of tubes and with their rearwardly converging walls parallel to the forwardly converging walls of said rear row, the flat front surfaces of said intermediate tubes being aligned with the spaces between the tubes of the front row.

3. An automobile radiator comprising upper and lower tanks, triangular tubes connecting said tanks and vertically spaced radiating plates through which said tubes are passed, said plates having vertically turned triangular lips that engage the triangular sides of said tubes, said triangular lips being of such dimensions that, when turned into the planes of the respective radiating plates, they completely close the triangular tube passages.

In testimony whereof I affix my signature.

MEINHARD WITTE.