April 14, 1931. H. P. YEAGER 1,800,853

RADIATOR CORE

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Fig. 1.

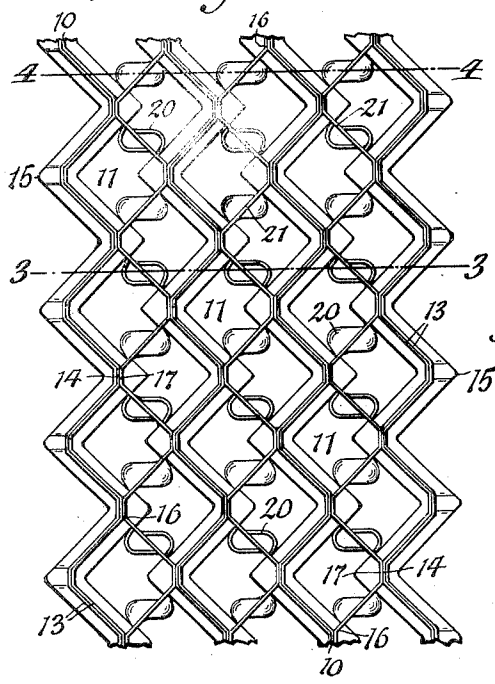


Fig. 2.

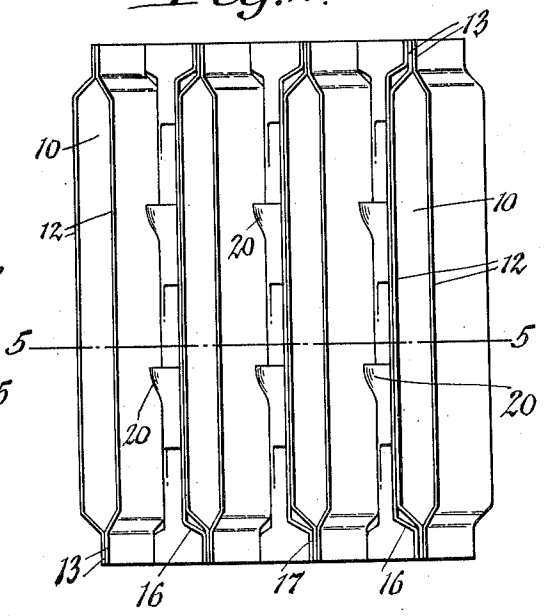


Fig. 3.

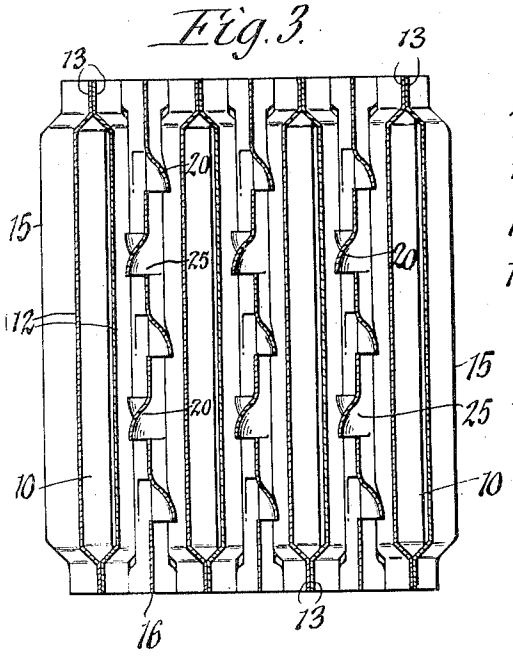
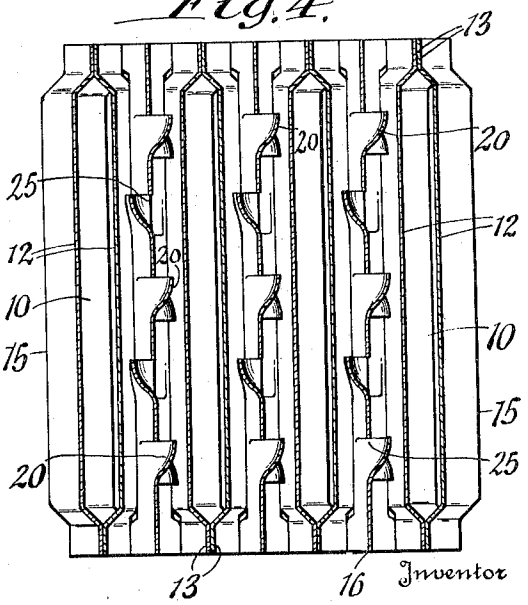


Fig. 4.



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Fig. 5.

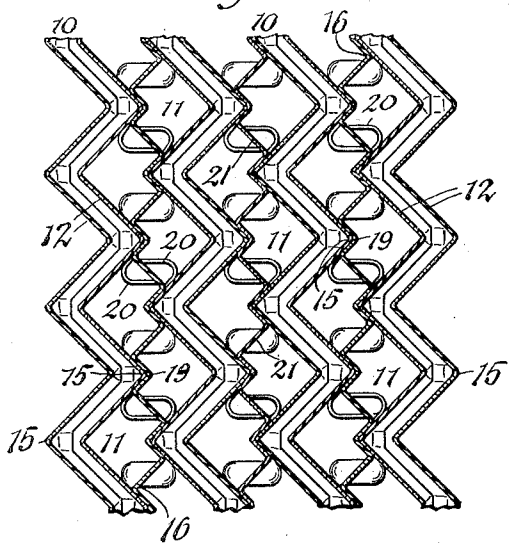


Fig. 6.

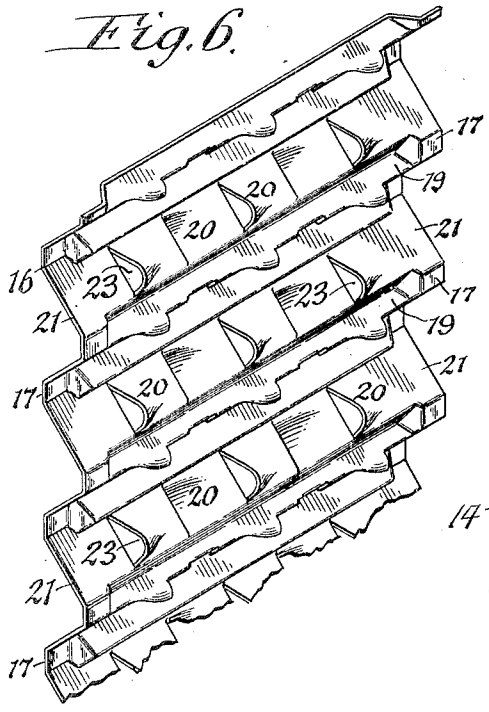
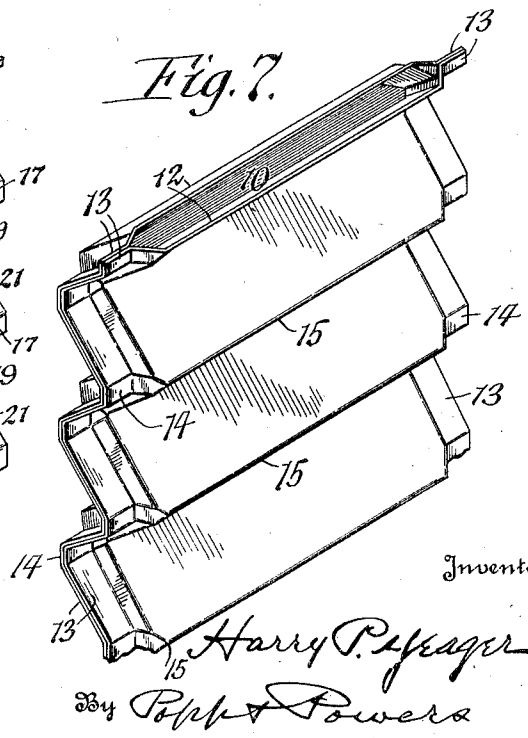


Fig. 7.



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Fig. 8.

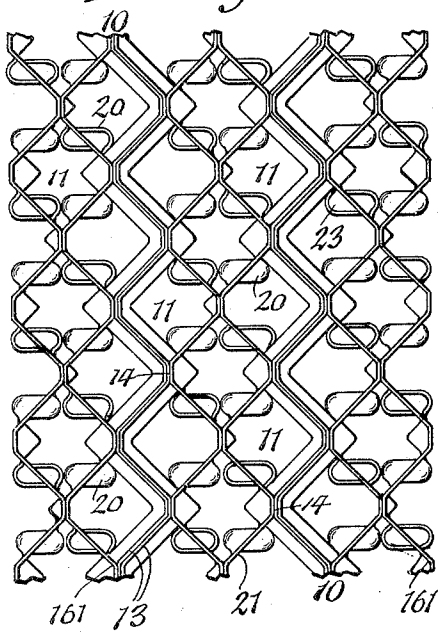


Fig. 9.

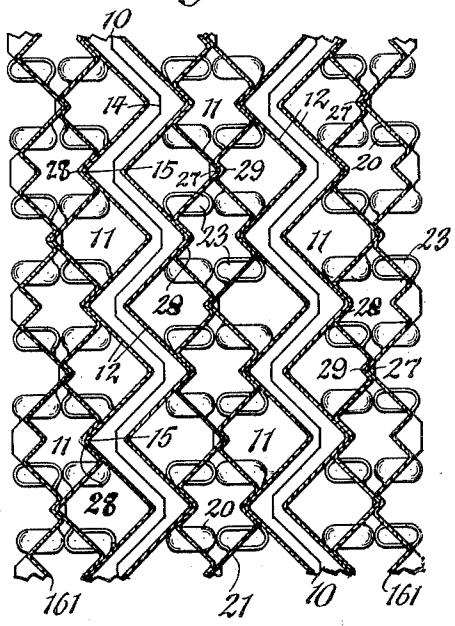
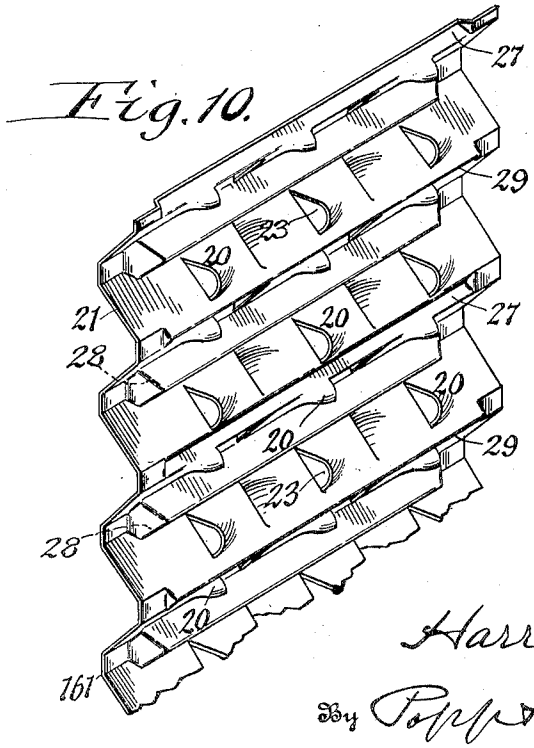


Fig. 10.



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1,800,853

UNITED STATES PATENT OFFICE

HARRY P. YEAGER, OF BUFFALO, NEW YORK, ASSIGNOR TO FEDDERS MANUFACTURING COMPANY, INC., OF BUFFALO, NEW YORK, A CORPORATION OF NEW YORK

RADIATOR CORE

Application filed March 14, 1930. Serial No. 435,692.

This invention relates to a core commonly forming part of radiators such as are commonly employed in the cooling systems of gas engines used for operating automobiles, aeroplanes and similar installations.

The object of this invention is to provide a core of this character in which the air while passing through the core is diverted from a straight course by baffle means so as to take a serpentine or zig-zag course and thereby produce a turbulent action of the same which causes an increased transfer of heat to the air from the water in the core and the efficiency of the radiator is improved.

In the accompanying drawings:

Figure 1 is a fragmentary front elevation of a radiator core embodying my invention.

Figure 2 is a top plan view of the same.

Figures 3 and 4 are horizontal sections on the correspondingly numbered lines in Fig. 1.

Figure 5 is a vertical section taken on line 5—5, Fig. 2.

Figure 6 is a perspective view of one of the radiating fins constructed in accordance with my improvements.

Figure 7 is a similar view showing two water tube walls assembled for use in connection with radiating fins containing my invention.

Figure 8 is a fragmentary front elevation of a radiator core containing a pair of radiating fins between adjacent water tubes instead of only one fin between adjacent tubes as shown in Figs. 1–5.

Figure 9 is a vertical section of the core shown in Fig. 8.

Figure 10 is a perspective view of one of the radiating fins employed in the construction of the core shown in Figs. 8 and 9.

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

Referring to Figs. 1–7, the numeral 10 represents a plurality of water tubes which in the present case are arranged generally in an upright position and adapted to receive the water or liquid to be cooled at their upper ends and to discharge the same in cooled condition at the lower end thereof. The spaces between adjacent water tubes are divided into a plurality of air passages 11 which extend horizontally from the front side to the rear side of the core whereby the temperature of the water is lowered by transference of heat from the water flowing through the tubes 10 to the air flowing through said air passages.

Each of the water tubes 10 is formed between two opposing strips or sheets of metal which are corrugated so that the water passage between the same is of zig-zag form. The central parts of these strips are imperforate and constitute the side walls 12 of the water tube and the opposite vertical edges of the strips are offset relative to the side walls forming flanges 13 which are secured to each other by soldering, or the like, and thereby constitute the end walls of the water tube.

The summits 14 of the corrugated wall strips at the offset flanges 13 thereof are preferably flat, but the summits 15 of the corrugations on the exterior of the side walls of each water tube strip are of convex or salient form between the respective flanges.

The spaces between the several water tubes are divided by the radiating fins into a plurality of horizontally extending air passages the number of such fins in each space between adjacent water tubes being determined by varying requirements and conditions, one of these fins 16 being employed in each space between adjacent water tubes in the construction shown in Figs. 1–5.

Each of these fins consists of a corrugated strip of sheet metal the summits of which are provided at opposite longitudinal edges of the strip with flat faces 17 which engage with flat faces 14 on the summits of the adjacent flanges at opposite edges of the respective water tube strips, and intermediate of the opposite longitudinal edges of each fin strip each of its summits is provided with a longitudinal concave seat or groove 19 which is adapted to be engaged by the convex longitudinal summit 15 on the intermediate parts or side walls of the adjacent water tube strips, thereby interlocking said radiating fin strip and the respective water tube strips and

holding the same against horizontal and vertical displacement relative to each other.

Heretofore the air passed through the air passage in the form of straight stream which causes only a moderate engagement of the same with the radiating fins and tube walls and consequently only a moderate transference of heat from the hot water to the air. To increase this heat transference the air in the present construction is caused to pass back and forth through each slope 21 of the radiating fins and also strike the tube walls at an angle so that the air passes through the air passages in the form of serpentine streams and also rebounds from the tube walls so that the air is agitated or converted into a turbulent condition, whereby the progress of the same through the air passages is impeded and all parts of the same are brought into more intimate contact with the metal of the radiating fins and the water tube wall, thereby increasing the cooling efficiency of the core for a given amount of metal accordingly.

This zig-zag course and turbulent condition of the air is perferably effected by providing each slope of each radiating fin with a plurality of scoop shaped baffles 20 which project laterally from the respective slope. Each of these baffles has a wide mouth 23 opening lengthwise of the respective slope and inclined from this mouth toward its base where the scoop shaped baffle connects with said slope. Each of these baffles is preferably formed by making a slit vertically in the respective fin strip or transversely of the path of the air stream and deflecting the metal of the strip on one side of the slit laterally into the form of a scoop, as shown in Figs. 1–6.

In the preferred construction the scoop shaped baffles in each slope of a fin strip are arranged partly on one side of this slope and partly on the opposite side of the same, and the scoops on one side of this slope alternate with the scoop on the other side thereof. Due to this construction the air in passing successively through a row of scoop baffles on one slope of the radiating fin will take a zig-zag, or serpentine path through the core and thus come into more intimate contact with the metal of the respective fin and thereby increase the heat transference from the water to the air accordingly. Furthermore, by causing the air to pass back and forth through the slopes of the fins the air is also caused to engage the walls of adjacent water tubes at an angle and thereby further increase the heat transferring effect.

If desired all the scoop shaped baffles may have their inlets or mouths facing lengthwise in the same direction but it is preferable to face the mouths of the baffles on some slopes lengthwise in one direction and face the mouths of the baffles on other slopes in the opposite direction, as shown in Figs. 2, 3, 4 and 6. In such an organization these baffles which have their mouths facing toward the oncoming stream of air in one air passage will intercept the air in the manner of a scoop and deflect the same through the opening 25 formed in the slope by the displacement of metal constituting the respective scoop so that this air enters the passage on the opposite side of the slope, then rebounds from the opposing water tube wall, and is then intercepted by the next following baffle scoop and again directed through the next following opening in the respective slope, this passing from one side of each slope to the other being continued until the air escapes from the rear end of the respective air passage.

These scoop shaped baffles which have their mouths facing away from the oncoming stream of air permit the air to be drawn by suction from one side of the slope to the opposite side thereof through the openings formed by deflecting the metal constituting these baffles, so that the same also cause air to move in the form of a serpentine stream through the core.

As a result of this construction, the turbulence of the air stream is increased, a greater water cooling efficiency is obtained, and a better distribution of the cooling effect of the air is obtained because the air is free to pass through the several radiating fins and thus balance the air streams relative to each other.

When more than one radiating fin is employed in the space between two adjacent water tubes, as for example, two fins 161 shown in Figs. 8 and 9, those summits of the fins lying next to the water tubes are provided with concave seats or grooves 28 which are engaged by the summits 15 of the corrugations of the water tube walls, but the summits of each of these fins which face the other companion fin are alternately of convex and concave form, as shown at 27, 29, and in assembling a pair of such fins the convex summit 27 of one fin engages with a concave summit 29 of the companion fin, as shown in Fig. 9, therefore interlocking this pair of fins and holding the same against displacement relative to each other.

I claim as my invention:

A radiator core having a plurality of water tubes and a plurality of air passages arranged between said water tubes, each of said water tubes having opposed walls consisting of two corrugated strips of metal which have their opposite longitudinal edges offset to form flanges engaging one another and their intermediate parts spaced from each other, and said air passages being formed by fins consisting of corrugated strips of metal arranged between adjacent water tubes, each of said fin strips having scoop-shaped baffles on opposite sides of its slopes and extending lengthwise thereof, the baffles on one side of

each slope alternating with the baffles on the opposite side of the same slope, and all the baffles on the same slope having wide mouths facing lengthwise of the slope, and the baffles of alternate slopes of each corrugated radiating fin having their mouths facing in opposite directions.

In testimony whereof I hereby affix my signature.

HARRY P. YEAGER.