

F. TODD.  
RADIATOR.

APPLICATION FILED DEC. 11, 1909.

993,318.

Patented May 23, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

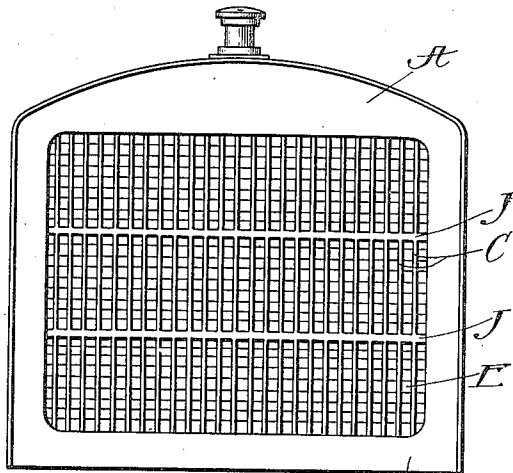


Fig. 3.

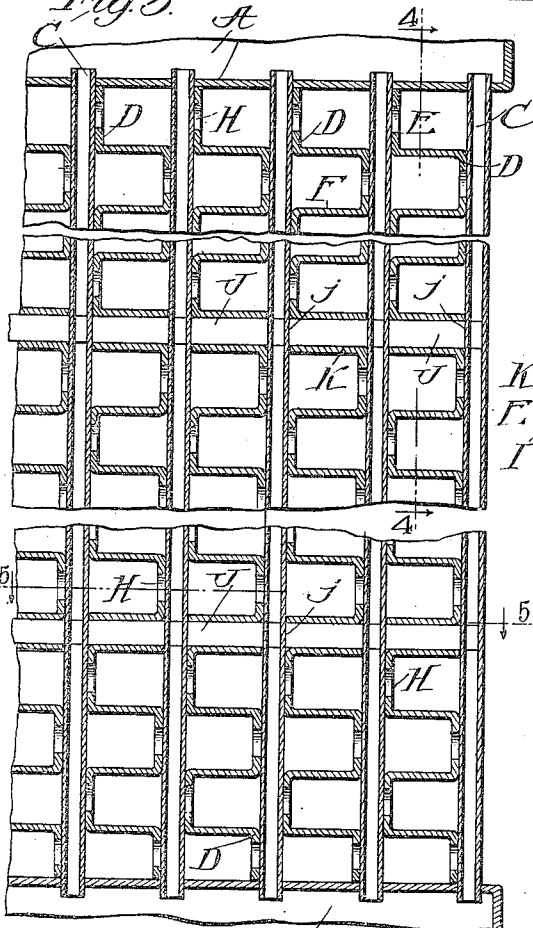
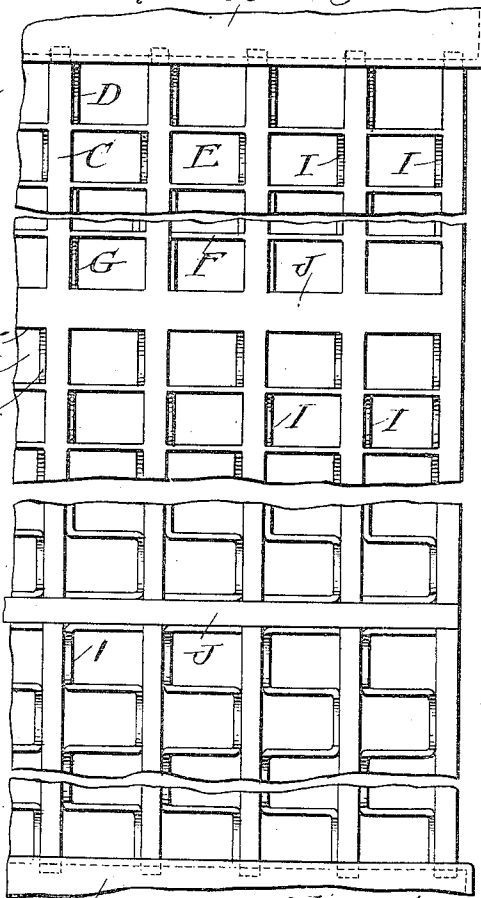


Fig. 2.



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RADIATOR.

993,318.

2 SHEETS—SHEET 2.



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# UNITED STATES PATENT OFFICE.

FRANK TODD, OF CHICAGO, ILLINOIS, ASSIGNOR TO JOSEPH B. LONG, OF CHICAGO, ILLINOIS.

## RADIATOR.

993,318.

Specification of Letters Patent.

Patented May 23, 1911.

Application filed December 11, 1909. Serial No. 532,555.

*To all whom it may concern:*

Be it known that I, FRANK TODD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Radiators, of which the following is a specification.

The present invention relates to that class of so called radiators that are adapted more especially for use on automobiles but it is manifest that the invention is applicable to any and all apparatuses in which the circulating medium passing through it is to be cooled, or to give up its heat to the surrounding atmosphere, such an apparatus being properly termed a radiator, or in which the circulating medium is to absorb heat from the surrounding atmosphere, such an apparatus being properly termed a cooler or refrigerator.

The primary object of the invention being to provide an efficient radiator for automobiles, the following description will, for the sake of brevity be confined to such a radiator, with the understanding, however, that I reserve to myself the exclusive right to use the several novel features of the invention in any apparatus for any specific purpose for which they may be adapted.

Desiderata in all radiators for automobiles include low cost of manufacture, lightness combined with adequate strength and durability, efficiency in radiating capacity combined with compactness, and ornateness, and the attainment of all of these in a single radiator, in as high a degree as practicable, is aimed at by the present invention.

The invention consists in the features of novelty that are hereinafter described with reference to the accompanying drawings, which are made a part of this specification, and in which:

Figure 1 is a front elevation on a small scale of a radiator embodying the invention, conventionalized. Fig. 2 is a front elevation of a section or fragment of a radiator embodying the invention, on an enlarged scale. Fig. 3 is a vertical transverse section thereof on the off-set planes indicated by the lines 3—3, Figs. 4 and 5, respectively, looking in the direction of the arrows. Fig. 4 is a vertical longitudinal section thereof on the line 4—4, Fig. 3. Fig. 5 is a horizontal section thereof on the offset line 5—5, Figs. 3 and

4. Fig. 6 is a view similar to Fig. 5 showing a slight modification.

In all of the several figures of the drawings, except Fig. 1, the sheet metal of which the so called channel strips and the water tubes are made is exaggerated in thickness.

The radiator has headers, A and B, into the former of which the water to be cooled, as it comes from the water jacket of the engine, is received while from the latter the water is returned to the water jacket after having passed through the tubes C, connecting the two headers. As shown in the drawings the headers are located one above the other and the water tubes are vertical, but this particular arrangement of the parts is not essential. According to the present invention, the water tubes pass uninterruptedly from the upper to the lower header and this has the advantage of avoiding any obstructions or irregularities within the tubes which would be incident to forming the tubes in a plurality of longitudinal sections arranged end to end. Each of the tubes in its lateral dimensions, preferably extends from the front to back of the radiator and has flat sides. The several tubes are arranged parallel with each other and spaced apart at such distances as will leave between them passages extending from front to back of the radiator through which the air may freely pass as the machine progresses. In each of these passages is arranged a so called channel strip, D, which is made in longitudinal sections arranged one above another so as to extend from one header to the other, excepting for slight intervals between the adjacent ends of adjacent sections, as hereinafter described. Each section of these so called channel strips consists of an integral strip of sheet copper bent rectangularly in such directions as to form a continuous series of rectangular channels, E, which open in opposite directions, or, in other words, have their open sides presented at opposite sides or faces of the strip. The front ends of the walls, F, which form the sides of the channels, are flush with the front sides or edges of the tubes and are common to adjacent channels, while the bottom walls, G, of the channels contact with the sides of adjacent tubes. These bottom walls are provided with openings or perforations, H, one object of which is to reduce weight, while an-

other object is to facilitate the passage of heat from the walls of the water tubes directly into the horizontal air passages, and in order that these perforations shall not seriously impair the strength of the radiating strip they are located wholly between the bends of the strip which result in the channels, leaving said bends or angular portions of the strip intact. The outer ends of the bottoms, G, of the channels are cut away or notched as shown at I so that they are not noticeable—in fact they are hardly visible—from the front of the radiator and these notches or cut away portions are provided principally for the sake of appearance in the completed radiator.

Looking at Fig. 3, it will be seen that at the open sides of the channels there is but one thickness of metal intervening between the water in the tubes and the air passages, namely the side wall of the tube, while at the bottoms of the channels, there is a double thickness, excepting where the perforations occur. If this double thickness were continued quite to the front sides or edges of the tubes, the face of the radiator would present an irregular appearance, while, on the other hand, as a result of the cutting away of the ends of the bottoms of the channels, the face of the radiator presents a symmetrical appearance made up of rectangular openings arranged in both horizontal and vertical alinement and having similarly alined boundaries of uniform thickness. That is to say, the front edges of the tubes, all of which are of equal thickness, form the vertical boundaries of the rectangular openings, while the side walls of the channels, all of which are of equal thickness form the horizontal boundaries of the rectangular openings, the tubes, however, being of greater thickness than the side walls of the channels.

The channel strips perform several functions. They serve to space apart and to brace against each other, to a greater or less extent, the intermediate portions of the tubes, and their side walls provide extended radiating surfaces for transmitting the heat from the walls of the tubes and radiating it into the air passages. When continuous tubes, extending uninterruptedly from one header to the other and therefore of considerable length, are used it is desirable to additionally brace the tubes against each other, laterally, as much as possible without materially reducing the aggregate area and capacity of the air passages and at the same time brace and strengthen the strips themselves, as against forces acting vertically and tending to collapse or distort the channels and at the same time assist in holding the channel strips with their channels in perfect alinement. To this end the forward sides or edges of all of the tubes are pro-

vided with alined notches, *e*, located at infrequent intervals from top to bottom of the tubes and in each row of notches is placed a continuous hard-metal strip, J, which, also, may be provided with notches *j*, as shown in Figs. 3, 4 and 5, so that the tubes and strips are interlocked, after the manner of an egg-case-filler, or the strips may be without such notches, as shown in Fig. 6. In either event the front surfaces of the tubes and strips are flush. As before stated, the channel strips are formed in separate longitudinal sections arranged one above another and with their upper and lower ends in contact with the upper and lower surfaces of adjacent strips, whereby the adjacent sections are spaced apart and supported and braced as against forces acting vertically upon them. Preferably each section terminates with the side wall of the last channel so that said side walls bear upon or contact with the bracing strips, J, throughout the entire depth of the channels as shown more clearly in Fig. 3. In a companion application of even date herewith, I have shown the channel strips as extending continuously and uninterruptedly from one header to the other and have shown the braces in the form of plugs or fillers of solder which completely close the forward ends of the channels in which they are arranged. These bracing strips of greater width than the tubes have the effect of giving the front face of the radiator the appearance of a plurality of horizontal panels and this is an appearance which is very popular with and much sought by the users of automobiles of the present day and this effect is still further enhanced by making the horizontal dividing lines narrower than the depth of the air passages.

I am aware that it has been proposed to use horizontal bracing strips and vertical water tubes all of which strips and tubes are similarly notched and interlocked in the manner above described, but I am not aware that horizontal hard-metal bracing strips, either with or without such notches, have ever been let into the front sides or edges of the tubes at infrequent intervals from top to bottom of said tubes and used in connection with channel strips arranged between the sides of adjacent tubes and contacting with such bracing strips, whether said channel strips have been formed in continuous lengths equal to the lengths of the tubes, or in separate longitudinal sections arranged end to end.

The continuous hard-metal strips interlocked with the water tubes in the manner described have the advantages of not only contributing to the rigidity of the structure, by bracing every part against every other adjacent part, but also in assembling the parts. In this the notches form guides, as

it were, for accurately insuring and facilitating the assembling of the parts in that no part can be inaccurately placed. Furthermore, by reason of the engagement of the  
5 bracing strips with the channel strips, the channel strips are supported and braced as against forces acting vertically upon them and the horizontal alinement of all of the channels is insured.

10 It will be understood that when all of the parts are assembled the front face of the radiator is immersed in a bath of molten solder whereby all of the joints are completely closed and sealed water tight.

15 What I claim as new and desire to secure by Letters Patent is:

1. A radiator having, in combination, two headers, a series of flat, parallel, continuous tubes extending uninterruptedly from one  
20 header to the other, said tubes being spaced apart leaving air passages between them, spacing, bracing and radiating strips, bent so as to form a continuous series of rectangular channels opening alternately in opposite  
25 directions, arranged in said passages with their channels in horizontal alinement, the bottoms of the channels of each strip being in contact with the sides of adjacent tubes and being cut away at their forward  
30 ends, while their sides terminate at their forward ends flush with the front sides of the tubes, the front sides of the tubes being provided at infrequent intervals with alined notches and continuous hard metal bracing  
35 strips arranged in said notches and engaging the channel strips, the front surfaces of the tubes and spacing strips being flush.

2. A radiator having, in combination two headers, a series of flat, parallel, continuous  
40 tubes extending uninterruptedly from one header to the other, said tubes being spaced apart leaving air passages between them, spacing, bracing and radiating strips bent so as to form a continuous series of rectangular  
45 channels opening alternately in opposite directions, arranged in said passages with their channels in horizontal alinement, the bottoms of the channels of each strip being in contact with the sides of adjacent  
50 tubes and being cut away at their forward ends, while their sides terminate at their forward ends flush with the front sides of the tubes, the front ends of the tubes being provided at infrequent intervals with alined  
55 notches and continuous hard-metal bracing strips arranged in said notches and engaging said channel strips, the front faces of the strips and tubes being flush and the channel

strips being made in separate longitudinal sections arranged one above another and  
60 with their upper and lower ends in contact with adjacent bracing strips.

3. A radiator having, in combination, two headers, a series of flat, parallel, continuous tubes extending from one header to the other,  
65 said tubes being spaced apart leaving air passages between them, spacing, bracing and radiating strips, bent so as to form a continuous series of rectangular channels opening alternately in opposite directions, arranged  
70 in said passages with their channels in horizontal alinement, the bottoms of the channels of each strip being in contact with the sides of adjacent tubes and being cut away at their forward ends, while their sides  
75 terminate at their forward ends flush with the front sides of the tubes, said tubes being provided in their front sides at infrequent intervals with alined notches, hard-metal bracing strips arranged in said notches, the  
80 front surfaces of the tubes and the bracing strips being flush and the channel strips being formed in separate longitudinal sections arranged one above another and each terminating in a side wall of the end channel,  
85 said side walls being in contact with adjacent sides of adjacent spacing strips, whereby the several sections of the channel strips are spaced and held apart.

4. A radiator having, in combination, two  
90 headers, a series of flat, parallel, continuous tubes extending uninterruptedly from one header to the other, said tubes being spaced apart leaving air passages between them, spacing, bracing and radiating strips, bent  
95 so as to form a continuous series of rectangular channels opening alternately in opposite directions, arranged in said passages with their channels in horizontal alinement, the bottoms of the channels of each strip being  
100 in contact with the sides of adjacent tubes and being cut away at their forward ends, while their sides terminate at their forward ends flush with the front sides of the tubes, the front sides of the tubes being provided  
105 at infrequent intervals with alined notches, and continuous hard-metal bracing strips arranged one above another and occupying said notches, said bracing strips being provided with notches and interlocked with  
110 the tubes, the front surfaces of the tubes and bracing strips being flush.

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Witnesses:

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