No. 858,258. PATENTED JUNE 25, 1907.

F. BRISCOE & J. M. ANGUISH.

PROCESS OF MANUFACTURING RADIATORS.

APPLICATION FILED SEPT. 28, 1906.

2 SHEETS—SHEET 1.

Fig. 1.

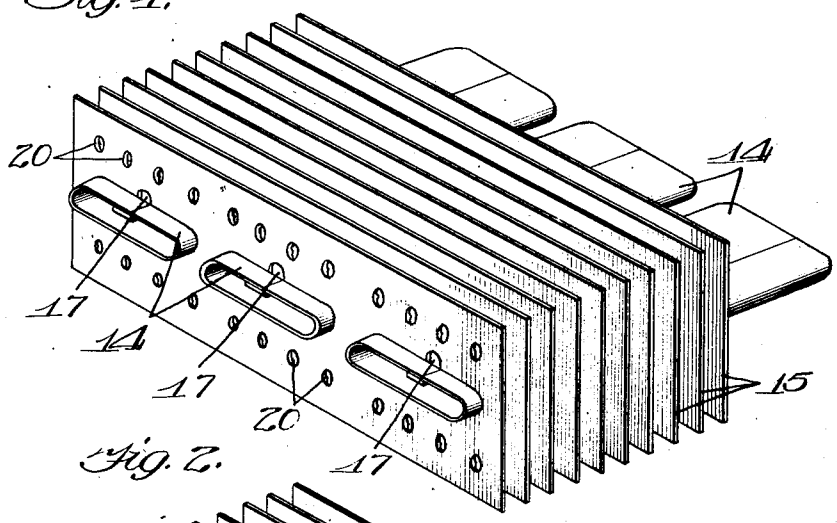


Fig. 2.

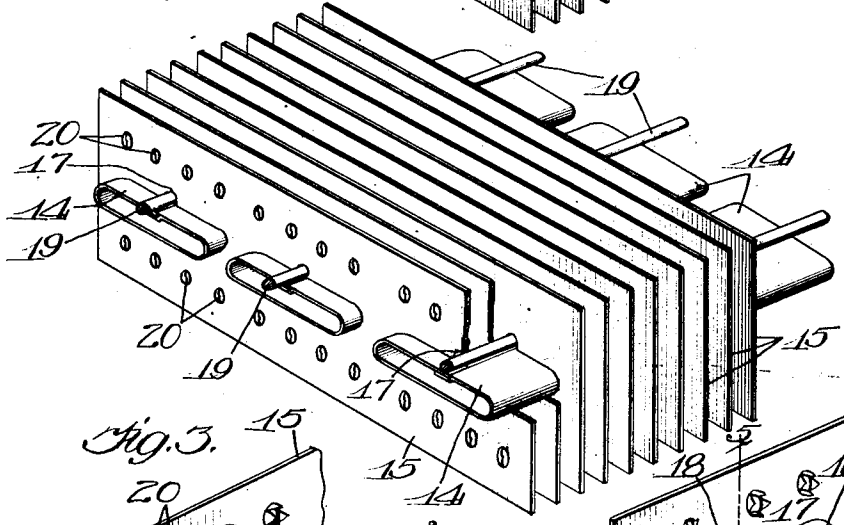


Fig. 3.

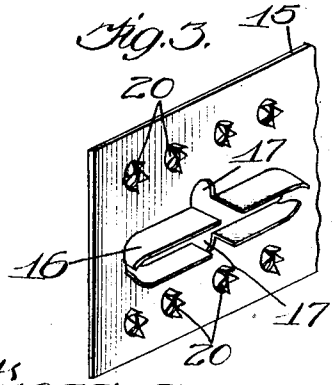


Fig. 5.

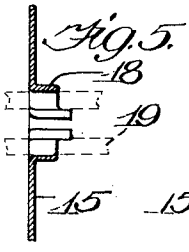
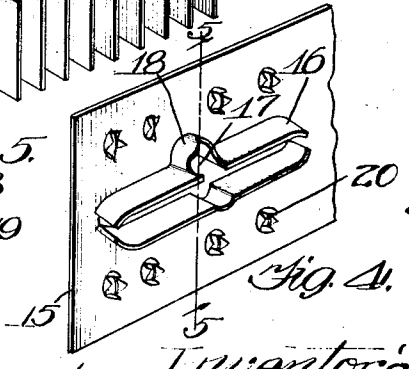


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 6.

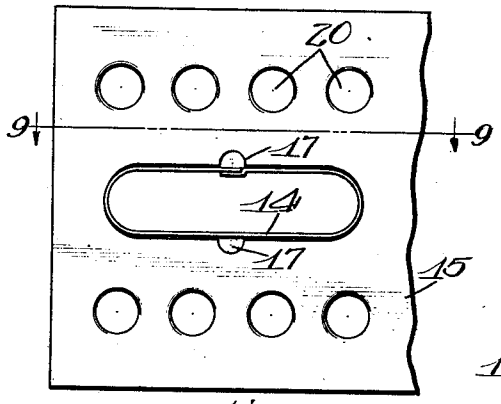


Fig. 7.

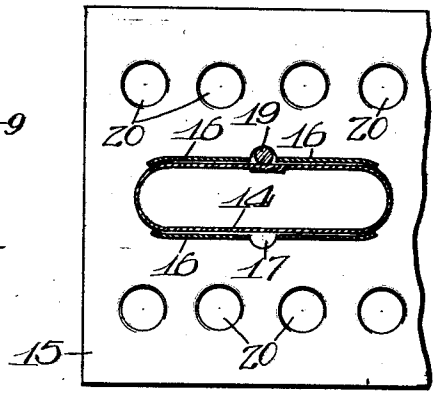


Fig. 9.

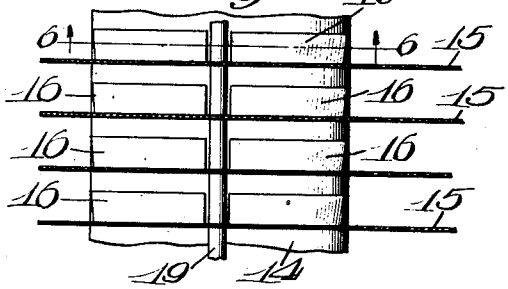


Fig. 8.

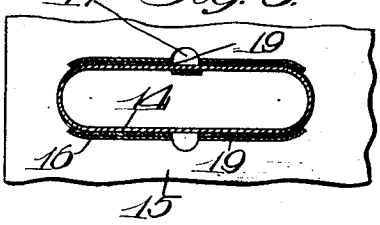


Fig. 10.

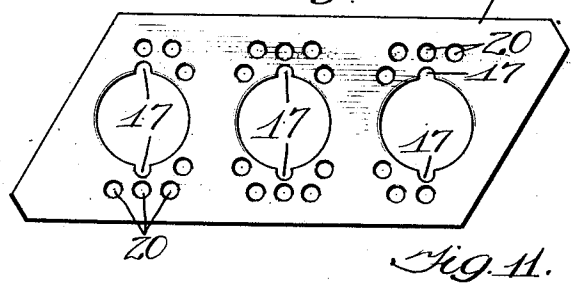


Fig. 12.

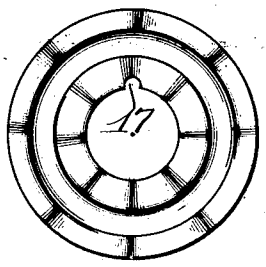
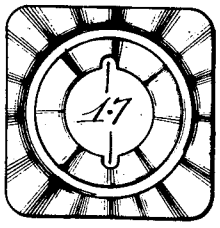


Fig. 11.



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UNITED STATES PATENT OFFICE.

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PROCESS OF MANUFACTURING RADIATORS.

No. 858,258. Specification of Letters Patent. Patented June 25, 1907.

Application filed September 28, 1906. Serial No. 336,627.

To all whom it may concern:

Be it known that we, FRANK BRISCOE and JAMES M. ANGUISH, citizens of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented a certain new and useful Improvement in Processes of Manufacturing Radiators, of which the following is a specification.

Our invention relates to radiators, coolers and condensers, such for example, as the radiators used for cooling liquid-cooled explosive motors in automobiles and similar vehicles. Radiators of this class consist in general of tubes through which the water flows in order to be cooled, and fins or gills projecting from the tubes for dissipating the heat therefrom. The efficiency of the fin is greatly increased by making a continuous metallic connection between it and the tube, which connection is done by soldering. In order to provide an ample connection a flange is thrown up around the aperture through which the tube passes, and it is desirable to have as much as possible of the surface of this flange soldered to the tube. This soldering has usually been accomplished in one of three different ways, to-wit: First, soldering by hand; second, dipping the assembled tube and fins into molten solder; or third, by first tinning the tube or fin, or both, then assembling and then heating the assembled parts which causes a fusion of the tin sufficient to produce contact of parts. The objection to the first mentioned method is that it requires considerable labor and is, hence, too expensive. The second method requires an excessive amount of the molten solder which necessarily adds both to the amount of material and weight. The third method produces poor contact.

Broadly speaking, the object of our invention is to provide means whereby good contact may be obtained with a minimum expenditure of labor and minimum quantity of solder or other fusing material. The specific method will be hereinafter described.

Generally speaking, we accomplish our object by perforating the fins at one or more points, such that when the fins are assembled upon the tubes these small apertures will register with each other, that is, form a line or row of apertures at, or near the side of the tube when viewed in the direction of the length of the tube. Into these registering small apertures is threaded a wire of solder or similar fusible material and the whole structure is then heated sufficiently to cause the fusing of the solder, which flows into the joints between the fin-flanges and the exterior surface of the water tube, thus forming a metallic bond or connection between the fin and the tube.

The process will be better understood by referring to the drawings in which

Figure 1 is a perspective view of a portion of a radiator showing the fins in position upon the tubes before the solder has been inserted. Fig. 2 is similar to Fig. 1 except that the fusible wire of solder or other similar material is shown in position within the assembled parts. Fig. 3 is a fragmentary perspective view showing the rear face of the fin with the contact flange thereof. In this form the solder aperture is clear cut, that is, cut away so that there is no bordering flange around the said solder aperture. Fig. 4 is similar to Fig. 3 but illustrates a modification in that a flange is present around the solder aperture. Fig. 5 is a sectional view taken on line 5—5, Fig. 4. Figs. 6, 7 and 8 are sectional views taken on line 6—6, Fig. 9. Fig. 6 illustrates respectively the tube and fin, assembled but prior to the insertion of the solder wire. Fig. 7 shows the solder wire in position ready for fusing, and Fig. 8 shows the parts after fusion. Fig. 9 is a plan view of a portion of the radiator showing fusion-flanges in position upon the water tube. Figs. 10, 11 and 12 are face views of various shapes of fins.

Similar numerals refer to similar parts throughout the several views.

Referring first to the form of device shown in Figs. 1 to 3 inclusive, and 6 to 9 inclusive, 14 represents tubes through which the water or other liquid to be cooled or condensed flows. For convenience of description they will be referred to as water tubes. In the form illustrated the width is considerably greater than the height and they have parallel top and bottom and rounded ends. This, however is a mere matter of design, and the invention applies equally well to tubes of any cross-sectional configuration. On one face of the fin, which will for convenience be referred to as back or rear face, are thrown up

flanges 16 which are designed to touch the water tubes as closely as possible. These flanges are integral with the fins and are formed by stamping in the manner well known in the art.

At one or more points in the fins at or near the opening for the tube are formed the solder-wire apertures 17. These apertures are located at the same relative point in each one of the fins with the result that when the fins are strung upon the tubes these apertures register; that is, are in line with each other when viewed in the direction of the length of the tube. These apertures 17 may be clear cut at the edges as shown in Fig. 3, that is, with no flanges bordering said solder apertures, or they may have such bordering flanges as illustrated in Figs. 4 and 5. There are as many of these apertures 17 in each fin at each tube as are required for the furnishing of sufficient solder, and considering the distance which the solder will flow, but for the sake of example, it may be stated that we have found by experiment that in a radiator wherein the tubes are approximately of the cross-sectional dimensions of 1/4″ x 1″ a single solder aperture on each side of the tube is sufficient. This, however, may be varied, depending upon the size of the solder wire employed, its fusibility and the space intervening between the tube and the flange 16.

After the tube and fins have been assembled in the manner above described with the apertures 17 registering with each other, a wire or bar 19 of solder or other similar fusible material is threaded through the series of apertures along the tube. When the parts are all thus assembled the solder is heated to melting point by any one of three methods to-wit: First, the assembled parts may be subjected to a flame or other external source of heat; second, a hot mandrel may be inserted into the tubes. Third, the assembled tubes, fins and wires may be placed within a furnace. It will be understood that previous to the assembling of the tubes and fins they have been prepared by a process commonly known as "pickling" for receiving and becoming fused with the solder. As a result of any one of the three above mentioned heating processes the soldering material is sweated uniformly between the flange and the tube and forms an excellent metallic contact or bond between them. The melted solder readily flows into the space between the flanges 16 and the tubes 14 so that when the parts are subsequently cooled the tubes and fins are to all intents and purposes integral with each other. It has been found by experiment that the solder flows almost entirely to the spaces between the aforesaid tubes and flanges where it performs its proper function instead of being wasted upon the surface of the tubes at points remote from the fins and flanges thereof.

The preferred method of heating the parts is by placing them in a furnace and it is obvious that our process is expeditious and economical of labor, as well as economical of material, and efficacious. The resulting product has minimum weight because not burdened with excessive and useless solder and the tubes and fins being thus free from useless solder, have maximum radiating power.

The result of the operation is practically the same whether the apertures 17 are clear cut as shown in Fig. 3 or flange-bordered as shown in Fig. 4.

It is probably unnecessary to state that the shape of the fins themselves is quite immaterial so far as the spirit of our invention is concerned, and the flanges may with equal results be a parallelogram, as shown in Fig. 10, square, as shown in Fig. 11, or round as shown in Fig. 12. In Fig. 12 the fin is shown to have a single solder aperture while in the other figures there are shown to be two of these apertures on opposite sides of the tube. In Figs. 10, 11 and 12 the tube receiving apertures are shown to be round for receiving cylindrical tubes, the shape of the tube being also immaterial in so far as the spirit of our invention is concerned.

What we claim as new and desire to secure by Letters Patent, is:

1. The process of manufacturing radiators and similar cooling devices comprising tubes and fins thereon, said process consisting in perforating the fins at the tubes, threading a filament of solder through the perforations in said fins, and subjecting the solder filament to melting heat while said filament is in place.

2. The process of manufacturing radiators and similar cooling devices comprising tubes and flanged fins fitting over them, said process consisting in perforating the fins and flanges at the tube apertures, assembling the fins on the tubes, threading a filament of solder through the perforations in said fins and subjecting the whole structure to a temperature sufficient to melt the solder.

3. The process of manufacturing radiators and similar cooling devices comprising tubes and flanged fins fitting over them, said process consisting of perforating the fins and flanges at the tube apertures, stringing the fins on the tubes so that the perforations in said fins register with each other, then threading a solder filament through said registering perforations and finally heating the entire solder filament to melting point to thereby simultaneously sweat all of the fin flanges onto their tubes.

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