No. 855,239. PATENTED MAY 28, 1907.

J. F. FARIES.

RADIATOR FOR EXPLOSIVE ENGINES AND METHOD OF MAKING SAME.

APPLICATION FILED FEB. 26, 1904.

2 SHEETS—SHEET 1.

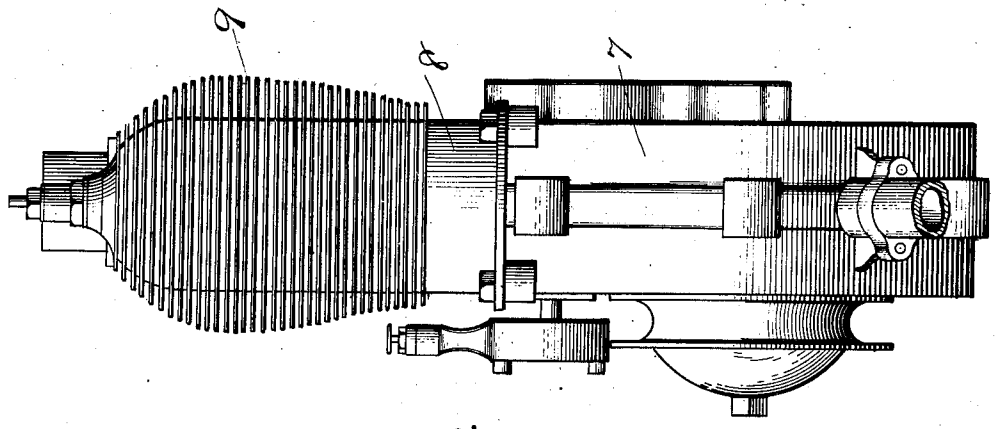

Fig. 2.

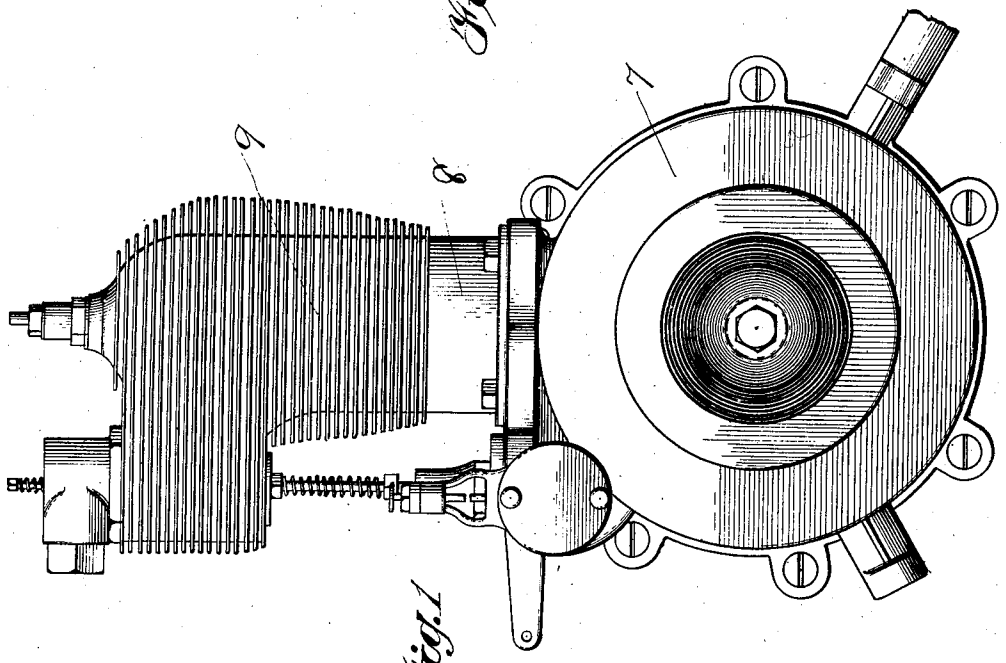

Fig. 1.

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Inventor:
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2 SHEETS—SHEET 2.

Fig. 3.

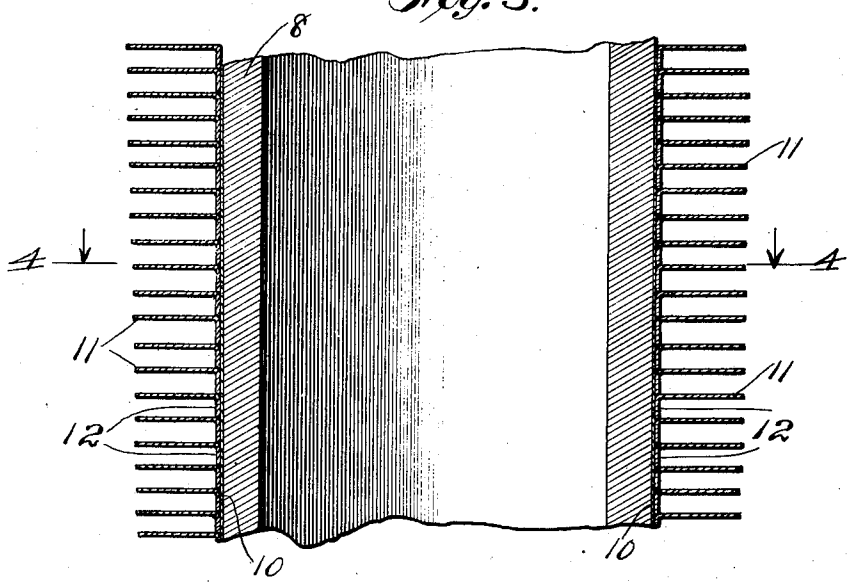


Fig. 5.

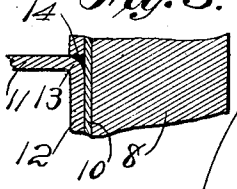


Fig. 4.

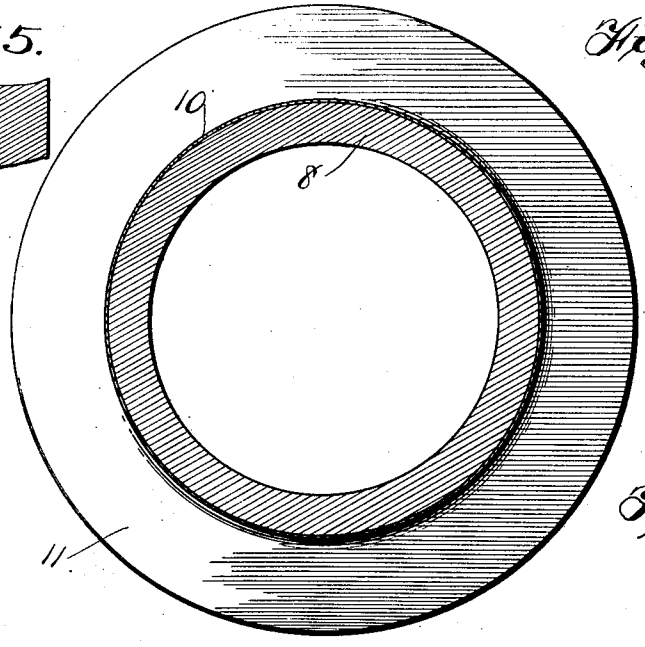
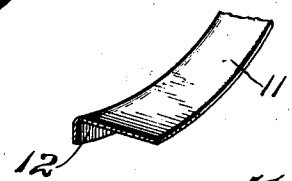


Fig. 6.



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UNITED STATES PATENT OFFICE.

JAMES F. FARIES, OF DECATUR, ILLINOIS.

RADIATOR FOR EXPLOSIVE-ENGINES AND METHOD OF MAKING SAME.

No. 855,239. Specification of Letters Patent. Patented May 28, 1907.

Application filed February 26, 1904. Serial No. 196,496.

To all whom it may concern:

Be it known that I, JAMES F. FARIES, a citizen of the United States, residing at Decatur, in the county of Macon and State of Illinois, have invented certain new and useful Improvements in Radiators for Explosive-Engines and Methods of Making the Same, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to radiators for explosive engines, and has particularly to do with radiators adapted to be used with air-cooled engines, such as are used to a considerable extent for automobiles.

In gasolene-engines, or motors employing air for cooling-purposes, it is the practice to provide the cylinder with a series of plates or flanges secured closely in contact with the cylinder so as to radiate the heat generated by the explosion within the cylinder; and it has been generally understood by those skilled in the art that copper was the best material for such flanges, owing to its high conductivity of heat. Much difficulty has, however, been experienced in securing a suitable contact between the copper and the cast-iron, of which the cylinder or explosion-chamber has been made. Owing to the high temperature necessary to braze to cast-iron, it has been found to be impracticable to unite the copper flanges to the cylinder in that way, as the copper would fuse, to a greater or less extent, at the brazing temperature; and consequently, while in some instances a measure of success has been secured, far more frequently the result has been entirely unsatisfactory. Various other expedients have, therefore, been tried,—such as shrinking the copper upon the cylinder. This method, however, is not satisfactory, owing to the fact that a proper contact is not secured between the copper and cast-iron. Another method that has been employed has been to cast flanges on the cylinder, but owing to the comparatively low conductivity of the iron the radiation has not been satisfactory. I have, however, discovered a method by which copper flanges may be united to a cast-iron cylinder; and such method, which, in its broadest aspect, is not restricted to the making of radiators for explosive engines, but may be employed for the uniting of copper to cast-iron for any other purpose desired, constitutes one of the principal features of my present invention. My invention also includes the product of such method.

My improved method consists in uniting the copper and cast-iron by means of a joining-medium of such character that it may be united to copper by brazing at a lower temperature than the fusing-point of the copper, and which is also susceptible of being welded to cast-iron. I employ for this purpose sheet steel,—the steel being welded to the cast-iron by melting the cast-iron and allowing it to cool in contact with the steel. The copper flanges are then united to the steel, by brazing in the usual way. For example, in making a cylinder the molten cast-iron is poured into a cylinder of extremely thin sheet steel,—the result being that the molten cast-iron raises the steel to a welding heat, the cast-iron and steel being thus firmly and inseparably united. The copper flanges in the form of rings are then placed in position upon the steel outer surface of the cylinder, and brazed thereto in the usual way. The copper is thus, in effect, brazed to the cast-iron cylinder,—insuring the perfect union of the parts, with the maximum of conductivity.

In the accompanying drawings,—Figure 1 is an elevation of an automobile-motor, showing the radiator; Fig. 2 is an edge view thereof; Fig. 3 is a partial vertical section, illustrating in detail the construction of the radiator; Fig. 4 is a horizontal section thereof, on line 4—4 of Fig. 3; Fig. 5 is an enlarged sectional detail, further illustrating the construction of the radiator; and Fig. 6 is a perspective view of part of one of the copper flanges.

Referring to the drawings,—7 indicates the motor,—of which 8 is the cylinder and 9 the radiator. The external steel shell of the cylinder 8 is shown at 10 in Figs. 3, 4 and 5.

11 indicates one of the radiating flanges, which, as above described, are made of copper and are brazed upon the outer surface of the steel shell of the cylinder. In practice, said flanges are made annular in form and are provided at their inner margins with a lip 12, bent preferably at right-angles, as shown in Figs. 5 and 6. The lips 12 may be employed to determine the distance apart of successive flanges, as shown in Fig. 3, but said flanges may be placed farther apart than the width of said lips if desired.

In practice, after the casting together of the steel shell and cylinder in the manner above described, the flanges 11 are succes-

sively placed in position thereupon,—the lower flange being first put in position, and the radiator being built up by adding flanges successively. When each flange is put in place a small amount of spelter, or other brazing-material, is placed upon each flange next to the surface of the shell of the cylinder. In order to provide for holding a proper amount of spelter the lips 12 are formed by bending the inner margins of the flanges, as shown in Fig. 5, so that the upper inner edge of each flange is rounded, as shown at 13 in Fig. 5. An annular pocket is thus formed for the spelter, which is shown at 14 in Fig. 5. When all the flanges of the radiator have been put in place the cylinder is heated in a crucible, or in any other suitable manner, to the temperature necessary to braze the copper and steel. When the spelter is heated hot enough to flow, owing to the manner in which it is disposed upon the flanges it runs down between the lips 12 and the surface of the shell 10, so that the lips are effectively brazed to the shell. I thus secure a perfect union of all the parts of the cylinder, with the result that there is no impediment to the transmission of the heat from the cylinders to the radiating flanges or disks,—thereby greatly increasing the efficiency of the radiator.

So far as I am aware, no one has heretofore united copper with cast-iron in the manner described, and my invention therefore includes broadly not only such method, but also the product produced thereby. Moreover, while my invention is designed primarily for use in uniting copper and cast-iron, I wish it to be understood that the terms "copper," "cast-iron" and "steel," as herein employed, are used in a generic sense, and are to be interpreted as covering also equivalent metals, as my invention includes the application of the process described to the uniting of such other metals as are susceptible of the same treatment.

That which I claim as my invention and desire to secure by Letters Patent is,—

1. The method of uniting metals the fusibility of one of which is below the brazing-temperature of the other, which consists in uniting said metals to a joining-medium the fusibility of which is less than that of one of the metals to be joined, and which is susceptible of being brazed to the more fusible of said metals, substantially as described.

2. The method of uniting metals the fusibility of one of which is below the brazing-temperature of the other, which consists in employing a joining-medium the fusibility of which is less than that of one of the metals to be joined, and which is susceptible of being brazed to the more fusible of said metals, welding said joining-medium to the less fusible of said metals, and brazing the other of said metals to said joining-medium, substantially as described.

3. The method of uniting copper and cast-iron, which consists in welding the iron to a joining-medium susceptible of being brazed to copper at a lower temperature than the fusing point of the copper, and then brazing the copper to such joining-medium, substantially as described.

4. The method of uniting copper and cast-iron, which consists in welding sheet steel to the iron, and then brazing the copper to the steel, substantially as described.

5. A cylinder, having a thin external steel shell welded thereto, and copper radiating-flanges brazed to said shell, substantially as described.

6. A cylinder, having a thin external steel shell welded thereto, and copper radiating-flanges brazed to said shell, said flanges having angularly-disposed lips at their inner ends, substantially as described.

JAMES F. FARIES.

Witnesses:
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