J. P. LYON.

RADIATOR.

APPLICATION FILED DEC. 20, 1913.

1,167,088.

Patented Jan. 4, 1916.

Fig. 1.

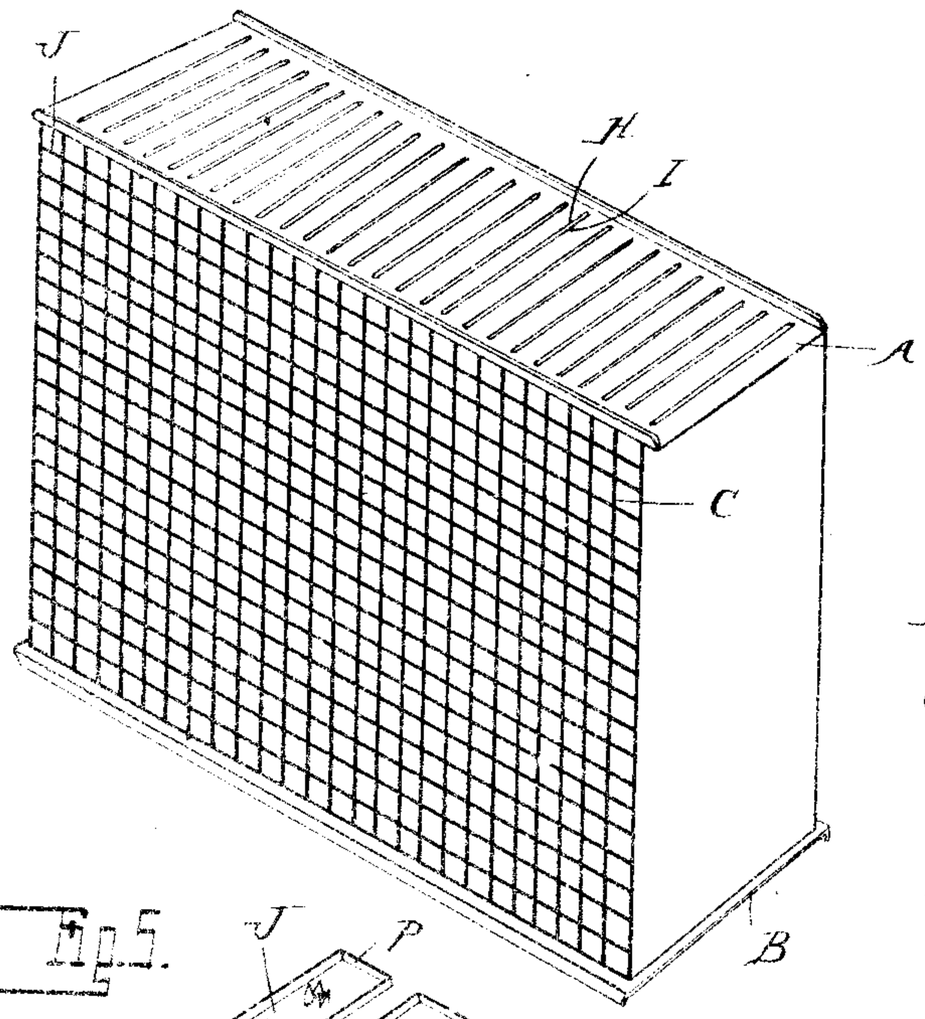


Fig. 2.

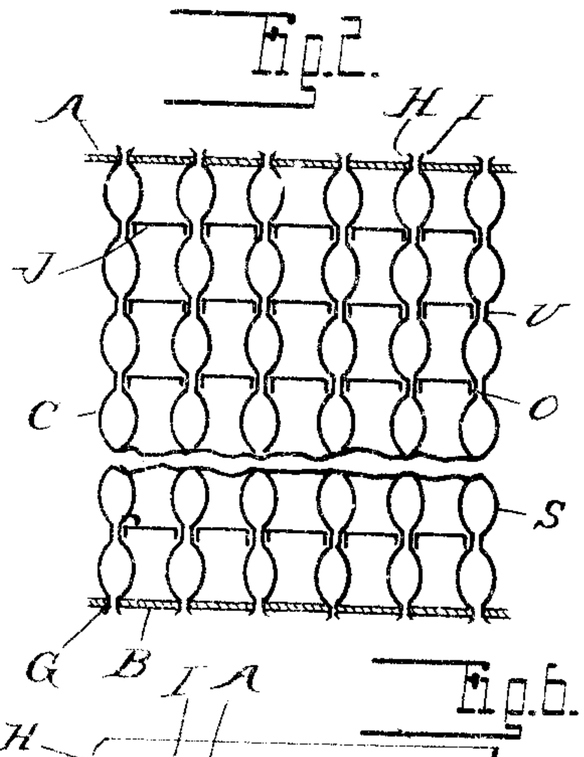


Fig. 6.

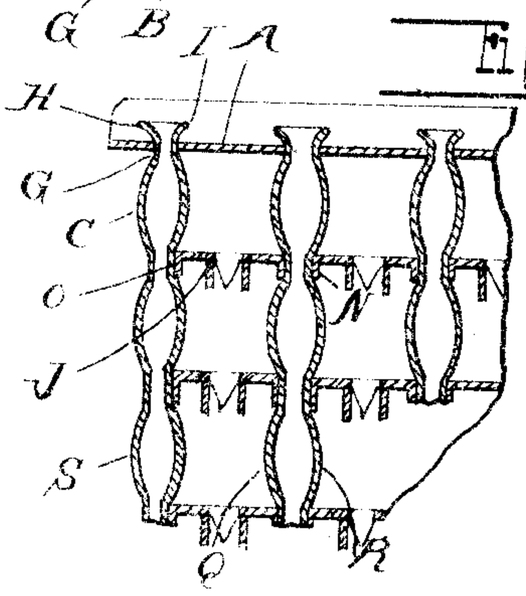


Fig. 5.

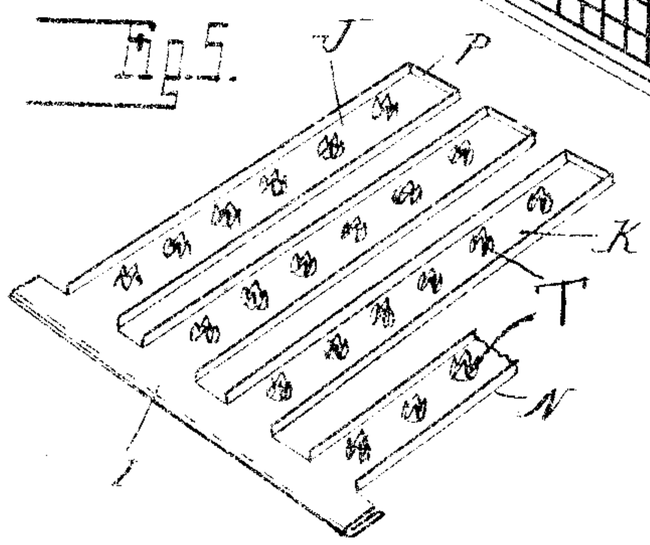
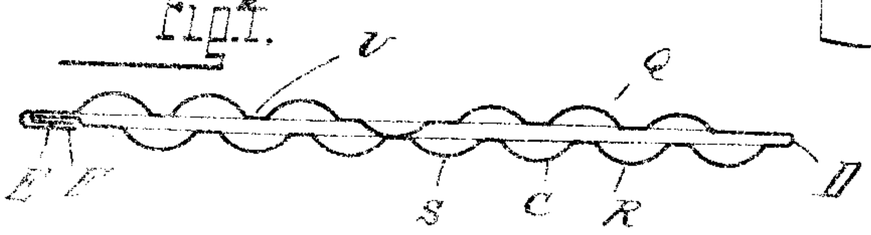


Fig. 4.



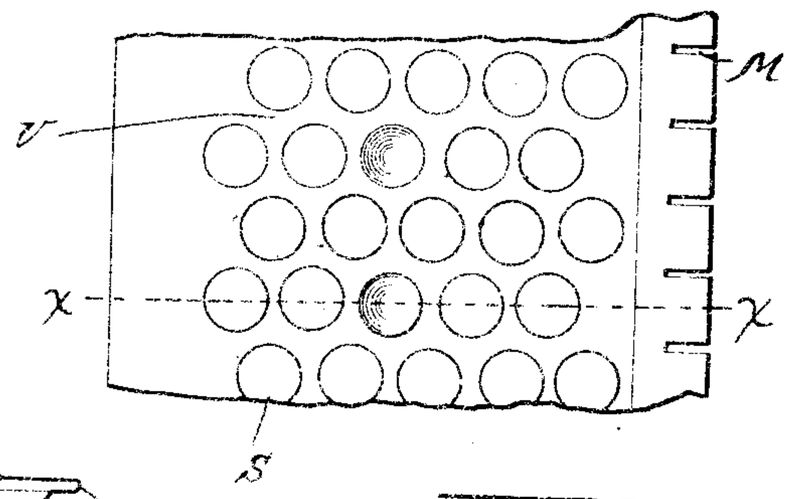


Fig. 3.

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UNITED STATES PATENT OFFICE.

JULIAN P. LYON, OF DETROIT, MICHIGAN.

RADIATOR.

1,167,088. Specification of Letters Patent. Patented Jan. 4, 1916.

Application filed December 20, 1913. Serial No. 807,862.

To all whom it may concern:

Be it known that I, JULIAN P. LYON, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Radiators, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to radiators and more particularly to radiators employed in connection with explosion engines.

The invention has among the objects thereof to provide an efficient and durable structure; to provide such a structure that may be easily and cheaply manufactured; to provide a construction in which the cooling efficiency is materially increased over radiators now in general use; to eliminate to a material extent the coating of solder on the surfaces exposed to the air circulating through the radiator; to provide a structure in which the water tubes are free from soldered joints intermediate the sides of the radiator; and further to provide a durable, simple and efficient water tube.

Other objects of the invention will more fully hereinafter appear.

The invention resides in the peculiar construction, arrangements and combinations of parts as will more fully hereinafter appear and as particularly pointed out in the claims.

In the drawings—Figure 1 is a perspective view of a portion of a radiator embodying the invention: Fig. 2 is a fragmentary vertical section of the structure shown in Fig. 1: Fig. 3 is a plan view of one of the tubes; Fig. 4 is a section on the line *x*—*x* of Fig. 3: Fig. 5 is a perspective view of one of the fins, and Fig. 6 is an enlarged fragmentary sectional view.

Referring to the one embodiment of the invention shown in the drawings, A designates the inner plate of one header of the radiator and B the inner plate of the other header.

C are a plurality of spaced water tubes having their top and bottom edges connected respectively to the members A and B, as will more fully hereinafter appear. The tubes C are each formed from a piece of flat metal folded upon itself to form a flat tube, the bend D closing one edge of the tube while the free ends E F are preferably return bent and pressed together to close the opposite edge. One end of each tube is inserted through a slot G in the member A and the opposite end of the tube is similarly engaged with the member B. The ends of the tubes are suitably connected to the headers preferably by bending out the marginal edges H I that project through the header plates, and then closing the joint between the plates and the tube by solder.

Arranged between the tubes are a series of spaced fins J, each of which is composed of a plurality of strips K that fit between adjacent tubes. Preferably the tubes C are of a length to extend from the top header to the bottom header, and of a width to extend from front to back of the radiator. I find it desirable to form the fins J each of a single piece of metal preferably of a width to extend from front to back of the radiator and of a length to extend completely from end to end of the radiator. The metal is slit to form the strips K and preferably the members K at their front ends are integral with a connecting section L which is interlocked with the front edges of the tubes as by providing slots M in the front edges of the tubes which receive the connecting portions, the corresponding slots in adjacent tubes being in horizontal alinement. In order to strengthen the portion L the latter is preferably bent downward and then return bent so as to form the section L of several plies of metal. This arrangement not only adds strength to the fin but also, since the forward edge of the tube is composed of several plies of metal, gives the radiator the appearance of a comparatively heavy structure. Furthermore the comparatively heavy interengaging portions of the tube and the fin will permit the fin of the radiator to stand a considerable thrust, without damaging the parts.

The sides of the strips K are in contact with the sides of the tubes, and in order to increase the efficiency of the heat-conducting joint between the tubes and the sections K, the edges of the latter are turned at substantially right angles, forming flanges N of materially greater width than the thickness of the metal, and the outer faces O of which bear against the tubes. The flanges N serve the additional function of reinforcing and strengthening the sections K, thereby permitting the fins to be formed of comparatively thin metal, increasing the cooling efficiency of the fin. Preferably the end P of

the sections K is also turned so as to add additional strength to the strips K.

Each of the sides Q R of the tubes are preferably provided with a series of cells S pressed outward therefrom and which are arranged in horizontal rows T extending, in the structure illustrated, from front to back of the radiator, the cells of the rows in one side being out of registration with the cells of the corresponding rows of the opposite side, as shown in Figs. 3 and 4. The corresponding rows upon opposite sides, however, are in alinement. These rows T are spaced sufficiently to form channels U between adjacent rows, of a width to nicely receive the flanges N of the strips K, thereby retaining the latter against vertical movement.

I find it desirable to so bend the flanges N that when the strips K are engaged with the tubes, the flanges will tend to spread, which will maintain a tight joint between the tubes and the flanges. This not only will insure the tubes and the sections K being in heat-conducting contact at all times, but will also avoid play between these parts, and as the metal of the tubes and the fins expands when the radiator becomes heated, in use the joints between the fins and the tubes are tightened. Furthermore the connection between the tubes and the fins before described permits a proper joint to be maintained between these members without the use of solder, materially increasing the heat-conductivity of the joint over a soldered one, as will be readily appreciated.

For certain uses I find it desirable to provide the strips K with openings T so as to allow a circulation of air vertically of the radiator, as well as laterally. In forming these openings in the strips preferably the metal is merely ruptured so that the area of the surface of the strip which is exposed to the air circulating through the radiator is not reduced. Similarly it will be noted that all the metal of the blank from which the fin J is formed is used, since the turning of the flanges N provides the necessary width to the slots for receiving the tube.

The sides of the tubes may be spaced in any suitable manner, but spacing is effectively accomplished by forming one or more—preferably a plurality—of inwardly-extending projections U′ on the tube sides, as will be best seen upon reference to Figs. 3 and 4.

In assembling the radiator the tubes are engaged with the header plates and the edges H I spread. The fins are then engaged with the tubes, which may be easily and readily accomplished since the channels U form guides which properly position the strips of the fins. Preferably in sealing the joints and connecting the parts together, the top and bottom of the radiator are merely dipped sufficiently to seal the joint between the plates and the edges H I, the front side merely sufficient to seal the joints of the tubes closed by the edges E F and solder the connecting portions L to the tubes, and the back side dipped to attach the free ends of the strips K to the tubes. This manner of dipping not only saves solder, thereby reducing the cost of manufacture and also the weight of the radiator, but increases the cooling efficiency, since neither the fins nor the tubes are coated with solder. The connecting together of the parts and the sealing of the joints, however, may be effected in any suitable way and it might be found desirable, for certain uses, to dip the entire radiator after the parts have been assembled.

From the foregoing description it will be readily apparent that the radiator is one that may be easily and cheaply manufactured and readily assembled, and that an exceedingly durable structure is provided; also that there are no joints in the tubes intermediate the sides of the radiator but that the seam of the tube is positioned so as to be readily accessible in case the seam leaks.

While I have shown and described the preferred form of my invention, I do not desire to limit my protection to the particular construction illustrated, but consider the invention to be of sufficiently broad scope to embody various modifications.

What I claim as my invention is:—

1. In a radiator the combination of a plurality of spaced tubes, each of a width to extend from front to back of the radiator and each having two substantially parallel slightly spaced side walls, the spacing being substantially uniform throughout the width of the side walls, each side wall having a plurality of cup-shaped cells arranged in horizontal rows extending from front to back of the tube, the rows being spaced and the corresponding rows upon the two side walls of the tubes being opposed whereby guides are formed, and fin strips extending from front to back of the radiator and positioned in the guides formed by adjacent rows in the cells, the sides of the strips being in substantial uninterrupted heat-conducting contact with the side walls of the tubes.

2. In a radiator the combination with a plurality of spaced tubes, each of a width to extend from front to back of the radiator, the forward end of each tube having a rebent portion closing the seam and forming a reinforced seam to close the same and the seam having a plurality of spaced slits, the corresponding slits in the seams of the tubes being alined, of a plurality of fins each having a plurality of strips arranged between the tubes and of a width to extend from front to back of the radiator and each fin having an integral part at its forward end connecting the strips and extending trans-

versely of the tubes, said connecting part being folded to provide a plurality of plies of metal, and the folded parts of the fins being arranged in the alined slits, whereby the fins are rigidly held in spaced relation at the forward edge of the radiator and the forward edge of the radiator reinforced.

In testimony whereof I affix my signature in presence of two witnesses.

JULIAN P. LYON.

Witnesses:
JAMES P. BARRY,
WM. J. BELKNAP.