No. 754,195. PATENTED MAR. 8, 1904.

J. H. BULLARD.

HEAT RADIATING DEVICE.

APPLICATION FILED JUNE 13, 1903.

NO MODEL.

Fig. 1.

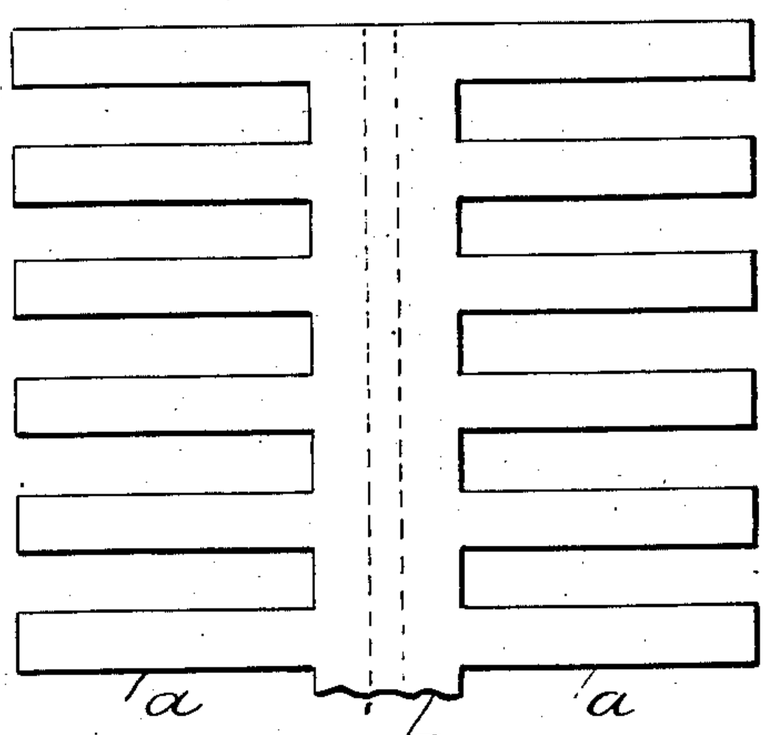


Fig. 2.

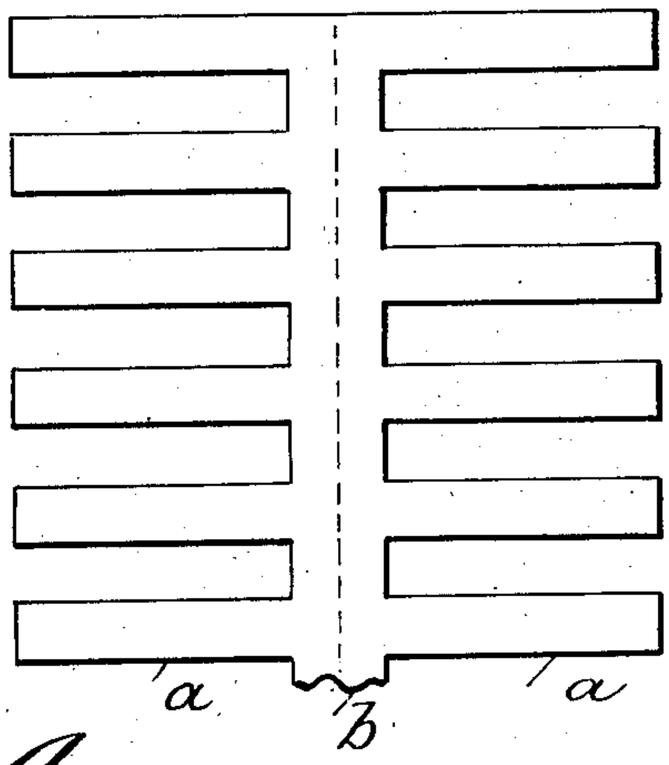


Fig. 3.

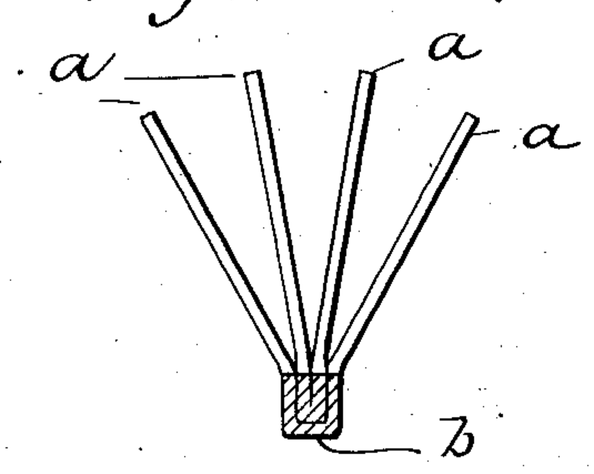


Fig. 4

Fig. 6.

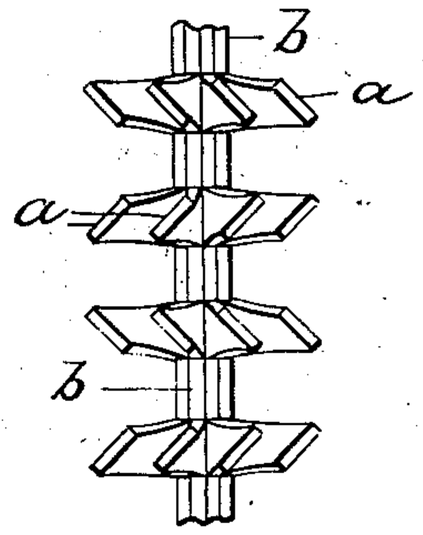


Fig. 5.

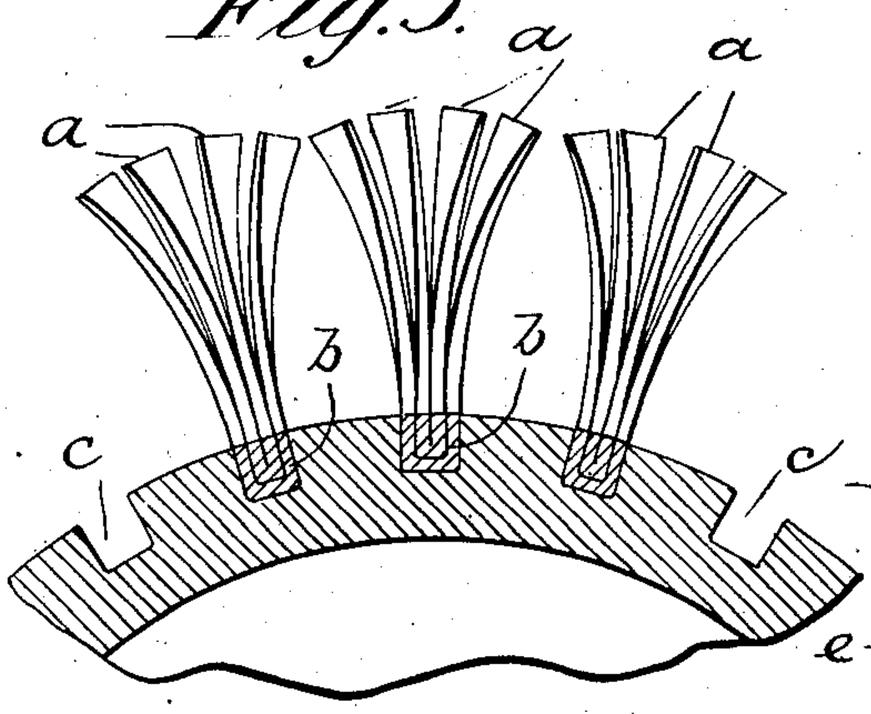
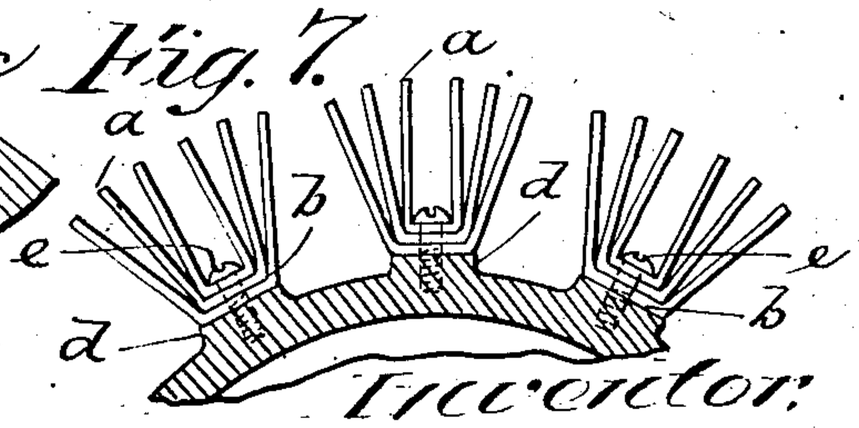


Fig. 7.



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No. 754,195. Patented March 8, 1904.

UNITED STATES PATENT OFFICE.

JAMES H. BULLARD, OF SPRINGFIELD, MASSACHUSETTS.

HEAT-RADIATING DEVICE.

SPECIFICATION forming part of Letters Patent No. 754,195, dated March 8, 1904.

Application filed June 13, 1903. Serial No. 161,294. (No model.)

To all whom it may concern:

Be it known that I, JAMES H. BULLARD, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Heat-Radiating Devices, of which the following is a specification.

This invention relates to heat-radiating devices such as are employed to effect the radiation of heat from radiators or other heaters or from the cylinders of internal-explosion engines as rapidly as possible, and the invention is directed especially to the construction of a heat-radiating device which may be applied to any of the above constructions, the object in view being to provide as great an area of radiating-surface for a given weight of radiating material as possible, and to provide it at a cost low enough to make the manufacture of the article a commercial possibility.

The invention consists of a radiating-strip of comb-like form which is made up of a number of thin plates secured together along that part thereof which would constitute the back of the comb, the portions of the plate which constitute the teeth of the comb being bent laterally outward on either side of the back.

In the drawings forming part of this application, Figure 1 is a plan view of a metal plate of which the radiating-strip is composed. Fig. 2 is a similar view of another of these strips. Fig. 3 is a sectional elevation of the strip composed of two plates secured together along their median lines, the radiating-surfaces of the plates being bent outwardly. Fig. 4 is a similar view of a radiating-strip made up of separate single plates. Fig. 5 shows in end elevation some of the radiating-strips applied to a surface to be cooled and showing the radiating-surfaces spirally bent in opposite directions. Fig. 6 is a plan view of a strip having the radiating-surfaces arranged in the manner shown in Fig. 5 in end elevation. Fig. 7 is an end elevation of the strips, showing another manner of their application to a heated surface.

In carrying out this invention a thin metal ribbon is punched out, as shown in Figs. 1 and 2, having, preferably, the laterally-projecting portions *a*, located in opposite relations along a centrally-located uniting portion *b*. The strips may, however, be divided longitudinally and these single plates laid side by side and secured together along the edge *b* thereof. These strips when in the shape shown in Figs. 1 and 2, after being punched and cut to the proper length, are passed through a machine and the two sides bent up together substantially on the dotted lines shown in said figures, the inner strip (shown in Fig. 2) being bent up flat and the outer strip (shown in Fig. 1) bent up over the folded edge *b* of the inner strip, the back portion *b* being so proportioned that the outer strip will inclose the back portion of the inner strip, as shown in various sectional views. These back portions of the radiating-strip preferably are united to constitute practically a homogeneous back by dipping the back portion *b*, composed of the folded-up plates, into molten brazing or soldering metal. The strip may then be finished to size and applied in any desirable manner to the surface from which the heat is to be radiated, the radiating-surfaces *a* being preferably bent out either as shown in Fig. 3 or in Fig. 5. If the strips are applied to the surface of some construction which is exposed to a current of air—as, for example, to the cylinder of an internal explosion-engine, such as is used on self-propelled vehicles—then the preferred manner of arranging the radiating-surfaces *a* is that shown in Figs. 5 and 6—that is to say, the surfaces constituting one group are slightly twisted alternately to the right and to the left from one end of the cylinder to the other, thereby presenting oppositely-inclined planes located in close proximity one behind the other, whereby the air will be directed from one set of these radiating-surfaces directly against those surfaces located to the rear thereof, thus insuring more perfect contact between the air and the radiating-surfaces. The finished strips are preferably inserted in grooves *c*, cut in the surface of a radiator or cylinder, (indicated by *c'*.)

In Fig. 7 there is shown a slight modification of the construction heretofore described,

and this modification consists in a construction which permits the application of the radiating-strip directly to the exterior surface to be cooled instead of fitting the strips into grooves in said surface like the grooves *c*. When the strips are applied directly to the exterior surface of a radiator, cylinder, or other surface to be cooled, ribs *d*, slightly raised above the surface of the radiator or cylinder, are cast thereon, which may be planed or turned off to constitute a bright and level surface, to which the radiating-strips may be applied, whereby a close-fitting intimate contact between the radiating-strip and said surface may be attained, for without a contact of this nature the radiating-strip is not effective relatively. In forming the strips which are to be applied to the prepared surfaces of the ribs *d* they are bent up to U-shape form in cross-section, as shown in said Fig. 7, one being adapted to inclose the other along the line of the uniting portions *b*. If the surface of the cylinder to be cooled is to be turned off smooth, the ribs *d* would be unnecessary. Obviously these strips may be L-shaped in cross-section instead of U-shaped without affecting their efficiency.

When the strips are made in the form shown in Fig. 7, their uniting portions *b* need not of necessity be brazed or soldered together; but these uniting portions may be superposed, as shown, and screws *e* be used to secure the constitutent elements of these strips together and to the surface to be cooled. It should also be stated that it would be quite within the scope of the invention to insert the strip of the form shown in Figs. 3, 4, and 5 in the grooves *c* of the surface to be cooled without first uniting these elements along the portions *b* thereof before so inserting them, for after they are so inserted the metal along the edge of these grooves may be staked in against the strip so solidly as to, in effect, make those portions of the strip within the grooves a practically homogeneous mass of metal.

The result of this construction therefore is to greatly increase the radiating area of the strip exposed to air while maintaining in intimate contact with the surface to be cooled a mass of metal whose cross-sectional area is so proportioned relative to that of the radiating-surfaces as to insure a free passage of the heat from the portions embedded in the metal of the cylinder to the radiating-surfaces. This construction is far cheaper and may be made much lighter than if a strip having an equal area were to be formed from a solid piece by the subdivision of the latter into several portions—that is to say, if a radiating-strip were made of solid metal equal to the thickness of the body portion thereof and the radiating portions be made of an equal thickness to the body and these radiating portions then subdivided vertically to provide an area equal to the construction shown in this application then the body portion would have to be made of such thickness as would equal three vertical saw-cuts plus the thickness of the radiating portions, which would obviously necessitate a much wider body portion than would be necessary if these were made according to this invention. It is therefore obvious that a greater area of radiating-surface for an equal weight can be provided by means of this invention than by the use of solid radiating-strips. In the built-up radiating device herein described, in which the back portion and the teeth-like radiating portions of each unit are of the same thickness, it follows that there will be no obstruction to the transmission of the heat contained in the body portion in the radiating-strips, such as would naturally follow if a solid tooth-like heat-radiating member were subdivided vertically, as above described, to increase the superficial area of said radiating portion.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. A heat-radiating device comprising a plurality of thin metal plates each consisting of a back portion, and separated heat-radiating teeth extending from said back portion; and means to secure said back portions together to constitute a substantially homogeneous body.

2. A heat-radiating device comprising a plurality of thin metal plates, each consisting of a back portion, and separated heat-radiating teeth extending from the edge thereof; means to secure said back portions together side to side into one substantially homogeneous body, whereby said heat-radiating teeth become disposed transversely of said body.

3. A heat-radiating device comprising a plurality of thin metal plates, each consisting of a back portion, and separated heat-radiating teeth extending from opposite edges thereof, said back portions being bent together along the central longitudinal line thereof, said back portions being nested and secured together to constitute a substantially homogeneous body, on which said teeth are transversely disposed.

4. A heat-radiating device comprising a plurality of thin metal plates, each consisting of a back portion, and separated equally-spaced heat-radiating teeth disposed along the edge of said plates. means to secure the back portions of the plates together into a substantially homogeneous body, whereby said teeth may become disposed along one side thereof in transversely-disposed series.

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