No. 822,996. PATENTED JUNE 12, 1906.

A. P. SMITH.

WATER COOLING APPARATUS.

APPLICATION FILED FEB. 24, 1903.

Fig. 1.

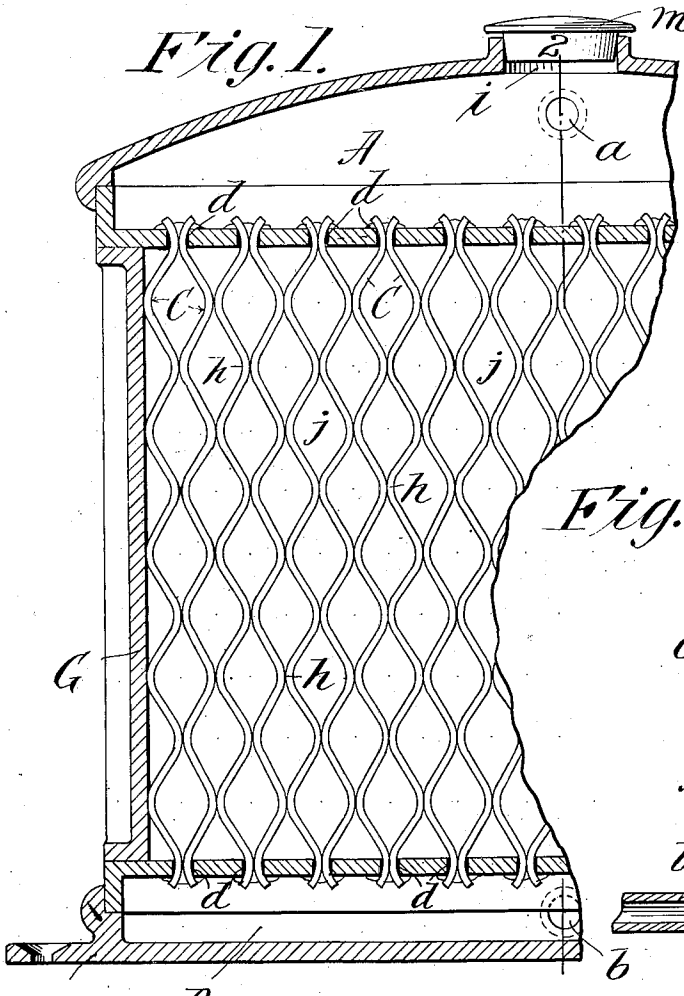


Fig. 2.

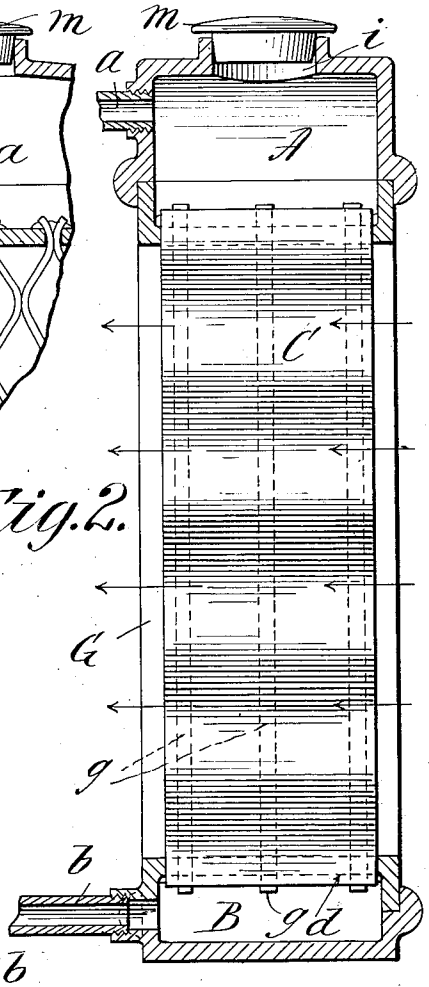
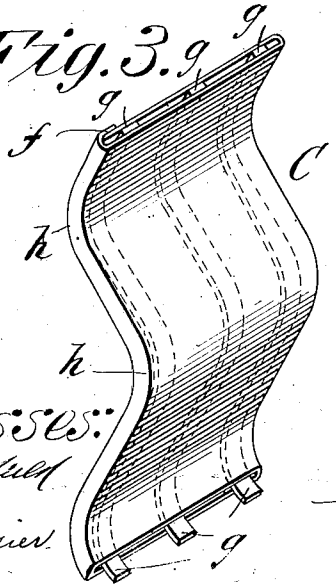


Fig. 3.



Witnesses:
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UNITED STATES PATENT OFFICE.

ARTHUR P. SMITH, OF SPRINGFIELD, MASSACHUSETTS.

WATER-COOLING APPARATUS.

No. 822,996. Specification of Letters Patent. Patented June 12, 1906.

Application filed February 24, 1903. Serial No. 144,670.

To all whom it may concern:

Be it known that I, ARTHUR P. SMITH, a citizen of the United States of America, and a resident of Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Water-Cooling Apparatus, of which the following is a full, clear, and exact description.

This invention relates to an apparatus especially applicable for use on automobiles for cooling the water which is employed over and over again for maintaining the cylinders of the motor at a suitably low temperature.

The object of the invention is to provide a cooling apparatus of comparatively simple and cheap construction having a maximum of cooling-surface in a minimum of space and susceptible, by reason of its location at the front or other suitable part of the vehicle, of receiving therethrough a constant flow of air as induced either by the motion of the vehicle or as induced by a mechanically-driven fan, or both, so that the warm water brought thereto to be cooled and to be conducted therefrom again to the motor will have the temperature thereof sufficiently lowered to accord with the desired conditions under which the motor-cooling water is to be employed; and the invention consists in two separate closed receptacles having, respectively, inlet and outlet passages for water and a plurality of flattened tubes communicating with and extending between the chambers of said receptacles, which flattened tubes have in their lengths a plurality of crimpings or corrugations whereby increased external cooling-surface is acquired; and the apparatus, moreover, comprises longitudinally-extending strips in each flattened tube, one in each tube, preferably between the edges thereof, for preventing the sides of the tube from becoming entirely collapsed; and the invention furthermore consists in constructions and arrangements of the parts, all substantially as hereinafter fully described, and set forth in the claim.

In the drawings, accompanying and forming part of this specification, Figure 1 is a front view of the apparatus, the upper and lower closed receptacles of which are shown in vertical section. Fig. 2 is a vertical section on the line 2 2, Fig. 1. Fig. 3 is a perspective representation of a portion of the length of one of the flattened tubes, of which in the apparatus a multiplicity are combined.

Similar characters of reference indicate corresponding parts in all of the views.

In the drawings, A represents the upper receptacle, having therethrough the inlet-passage *a*, and B represents the lower closed receptacle, for which is provided an outlet-passage *b*. In the bottom or lower wall of the upper receptacle and in the top wall of the lower receptacle are a plurality of transverse slots or apertures *d*, and extending from connection with upper and lower ones of these apertures are pairs of flattened tubes C, the character of each tube being clearly understood on reference to Fig. 3, and each tube has by its upper and lower ends communication with the respective receptacles. Each of the tubes C is formed of a single strip of sheet metal having a properly closed and secured lap-seam *f*, as shown in Fig. 3, the flattening of the tube being along lines one of which is adjacent the seam, and while it is desired and intended to flatten the tube very much, so that the opposite walls thereof are located quite closely in relation to each other. Nevertheless, on the other hand, the walls of the tube should not in any place contact one with another, and as a measure to maintaining the walls of the tubes in their proper slight degree of separation one or more narrow and comparatively thin strips *g* are provided longitudinally of the tube-constituting strip, so that when the tube is completed these strips will have their dispositions therein substantially as shown.

The crimpings or corrugations *h* of the tubes not only impart in the length thereof increased extent of external cooling-surface, but in the series produce the approximately diamond-shaped air channels or ways *j* from front to rear through the apparatus.

In the assemblage and combination of the parts pairs of sinuous flattened tubes have the proximate ends thereof engaged in and through the slots in the respective receptacle-walls, the securing and rendering of the connections tight being acquired by solder or like substance.

In practice it is advantageous to have the extremities of the tubes protrude inwardly beyond the inner faces of the slotted walls of the receptacles, so as to allow a layer or thickness of solder to be flowed by the protruding

end portions of the tubes and to fill and pack in the slots and yet without liability of clogging or stopping up the ends of the flattened tubes, which of course are understood as open to communication with the receptacle-chambers.

The upper receptacle has the water-supply opening *i*, for which a cap or plug *m* is provided.

The upper and lower receptacles constitute the corresponding border members of a rectangular frame of which the parallel vertical metallic uprights G are the connecting members, supporting the upper receptacle from the lower one.

This apparatus is to be mounted on the front or other suitable part of an automobile and to have by the conduit *a* pipe connection whereby the heated water to be cooled may be pumped into the upper receptacle, and the water gravitates from the upper receptacle through the series of flattened corrugated tubes into the lower receptacle, being thence conveyed back to the engine-cooling chamber of the motor.

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

A cooling apparatus, embodying a pair of spaced receptacles, the inner wall of each receptacle having a plurality of rectangular transversely-disposed slots extending the width thereof, a plurality of crimped tubes rectangular in cross-section and disposed opposite to one another to form diamond-shaped openings therebetween, said tubes being arranged in pairs, the ends of each pair of said tubes projecting through said slots and beyond the outer face of said inner walls of the receptacles, and solder engaging about said projecting ends of said pairs of tubes and seating on the outer faces of said inner walls of the receptacles.

Signed by me at Springfield, Massachusetts, in presence of two subscribing witnesses.

ARTHUR P. SMITH.

Witnesses:
A. V. LEAHY,
WM. S. BELLOWS.