No. 701,464. Patented June 3, 1902.

E. T. BURROWES.

WATER COOLING APPARATUS FOR MOTOR VEHICLES.

(Application filed May 7, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

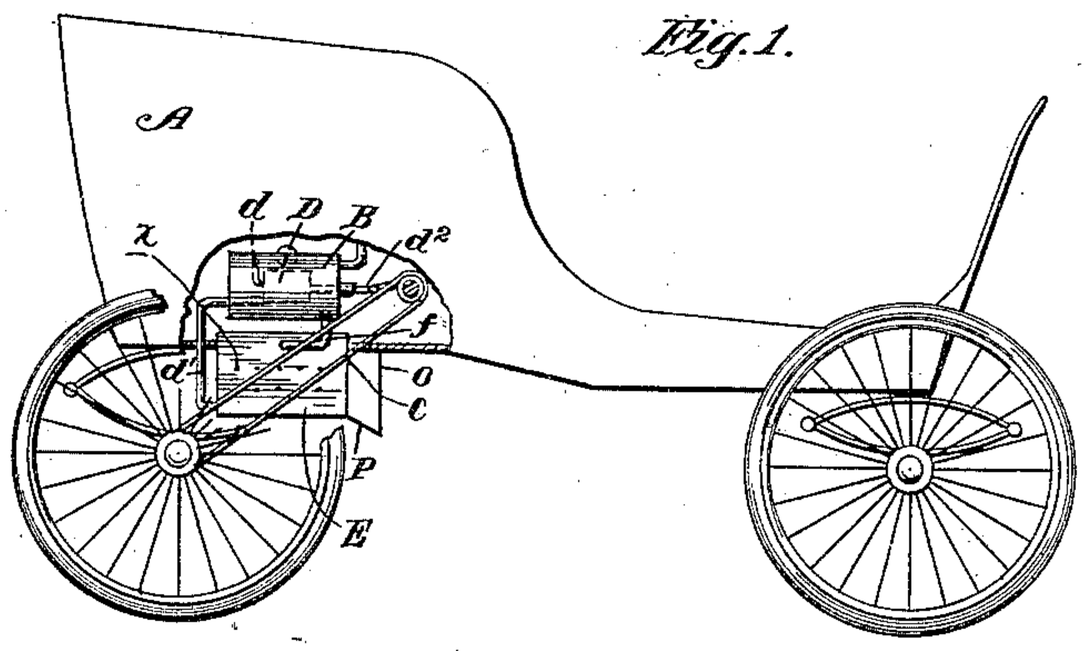
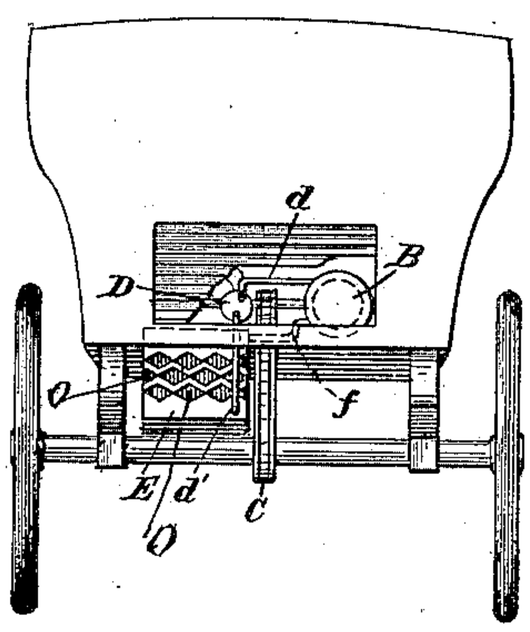


Fig. 2.



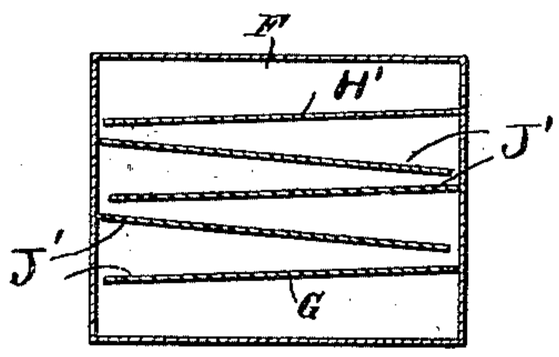


Fig. 8.

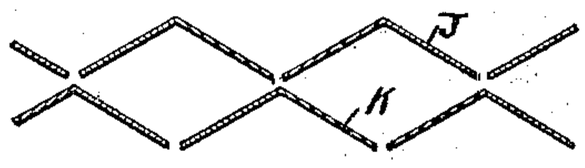
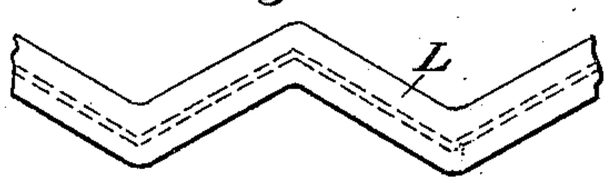


Fig. 9.

Fig. 7.



WITNESSES:

H. S. Austin

Jos. Spillane

INVENTOR

Edward T. Burrowes

BY F. S. Bacon

Attorney

No. 701,464. Patented June 3, 1902.

E. T. BURROWES.

WATER COOLING APPARATUS FOR MOTOR VEHICLES.

(Application filed May 7, 1901.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

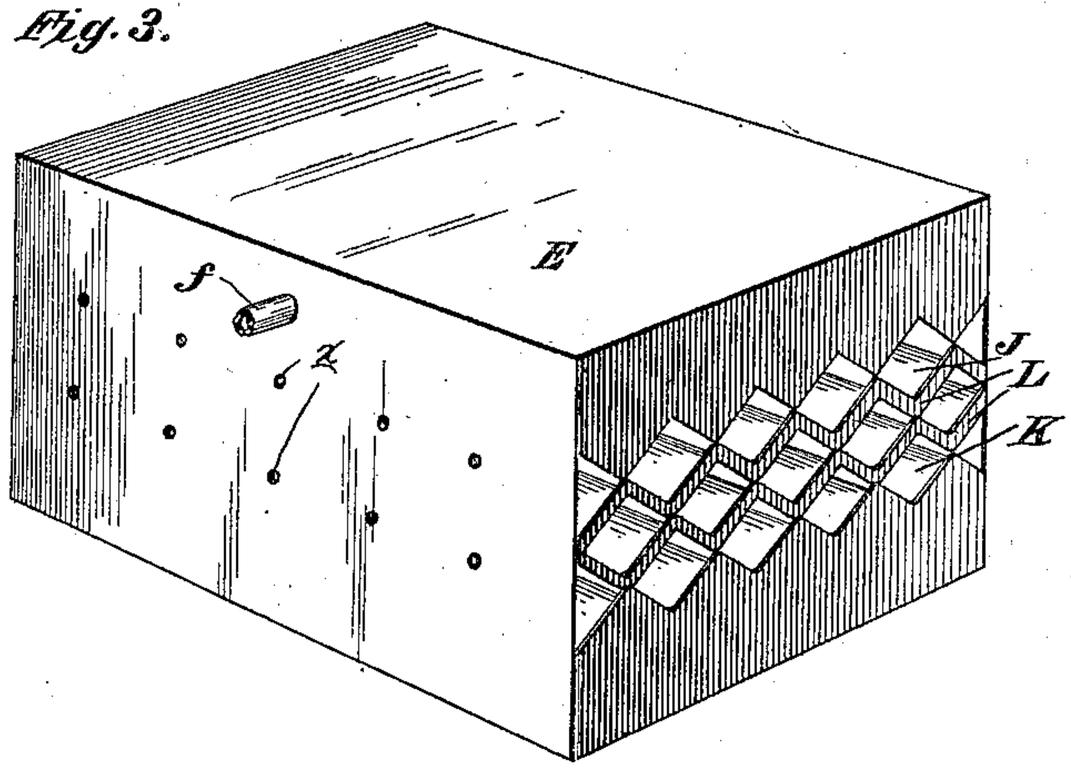


Fig. 4.

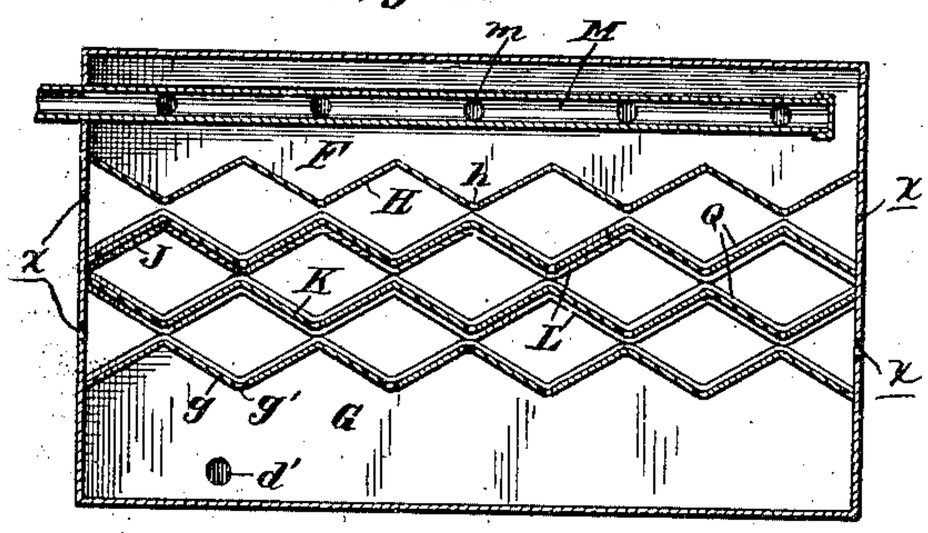


Fig. 5.

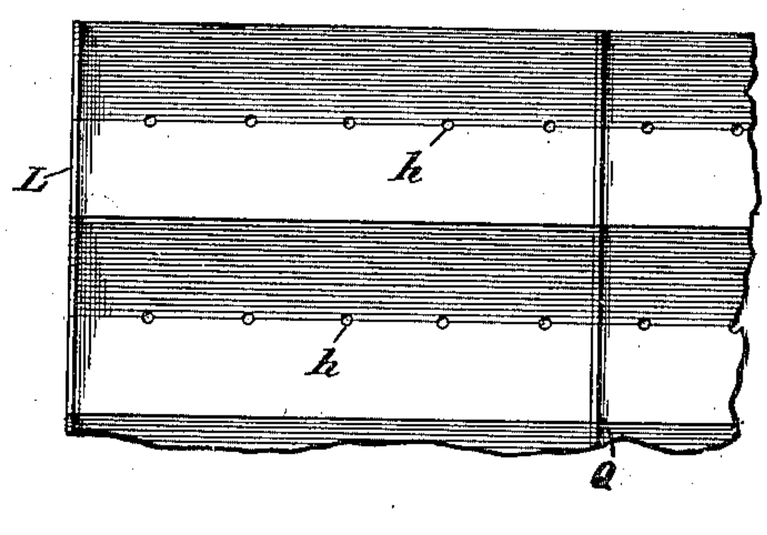
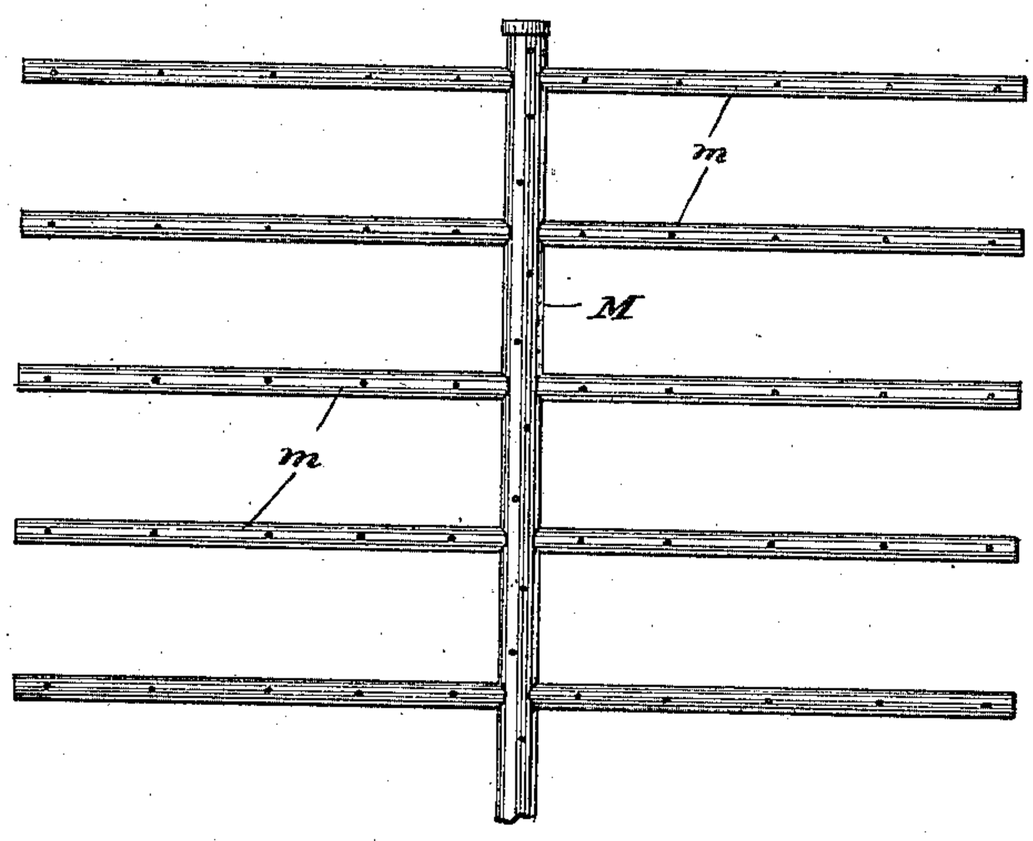


Fig. 6.



WITNESSES:

H. S. Austin.

Jas. Williams

INVENTOR

Edward T. Burrowes

BY H. S. Bacon

Attorney

UNITED STATES PATENT OFFICE.

EDWARD T. BURROWES, OF PORTLAND, MAINE.

WATER-COOLING APPARATUS FOR MOTOR-VEHICLES.

SPECIFICATION forming part of Letters Patent No. 701,464, dated June 3, 1902.

Application filed May 7, 1901. Serial No. 59,116. (No model.)

To all whom it may concern:

Be it known that I, EDWARD T. BURROWES, a citizen of the United States, residing at Portland, in the county of Cumberland and State of Maine, have invented certain new and useful Improvements in Water-Cooling Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to an improvement in water-cooling apparatus for engine-cylinders and other devices and is embodied in the construction and arrangement of parts presently to be described, and defined in the claims.

I shall describe the invention as applied to a motor-vehicle, for which it is well intended and designed, and in this connection would state that the general principle of the invention resides in utilizing the forced draft or currents of air created by the movement of the vehicle through an apparatus containing a moving body of water or adjacent to a moving body of water, so that the superfluous heat will be taken from the moving body of water, rendering the same cool and in condition for repeated use through the cooling-jacket of the engine-cylinder or in connection with other heated surfaces.

While the invention is shown and will be described in connection with a motor-vehicle, it is of course to be understood that it may be employed in many other connections.

While many apparatus have heretofore been suggested for cooling the heated water as it is taken from the water-jacket of the engine-cylinder, such apparatus are usually complicated and are not adapted for use in connection with motor vehicles or devices, and, further, such apparatus usually require special mechanism for effecting the cooling of the water, which is more or less expensive, and largely destroys their usefulness in connection with many devices, especially such as automobiles or motor-operated vehicles.

My invention is intended to provide a simple and convenient device for cooling the water and one which can be applied to various forms of motor-vehicles.

In the drawings, in Figures 1 and 2, I have shown the invention diagrammatically as applied to an "automobile" and so for the purpose of showing its applicability; but it is to be understood that various details of construction of the mechanism of the automobile, its connections, and actuating parts are shown diagrammatically for the purpose of simplifying this specification, inasmuch as the various motor mechanisms are not a part of my present invention, and any suitable or well-known motors, either of the explosive or other type, may be employed. I also wish it understood that the construction of the cooler represented here in the drawings and hereinafter described may be varied and changed in many respects and that the particular construction, while important, is illustrated for the purpose of showing an operative device for carrying out the principles involved and that the invention is not limited to the particular construction shown.

Fig. 1 is a side elevation, partly in section, of an automobile, the same illustrating a general driving mechanism largely in diagram for the purpose of showing the position of the cooling device relative to the bottom of the vehicle and the working engine. Fig. 2 is a similar view in rear elevation. Fig. 3 is a perspective view of the cooler. Fig. 4 is a cross-section. Fig. 5 is a detail plan view of a portion of the cooling device. Fig. 6 is a detail view of the water-distributer. Fig. 7 is an enlarged detail view of one of the edge flanges for the baffle or distributing surface, and Figs. 8 and 9 are modified forms of baffle-plates.

A designates a body of a motor-vehicle. B is the cylinder, which is shown in diagram, and C is the driving-belt. These features may be of any desired form or known construction. The cylinder B is, as usual, provided with a water-jacket of any approved form. Located at one side of the cylinder B is a circulating-pump D, having connection with the top of the jacket of the cylinder through the pipe d. This pump may be driven in any convenient manner by the motor, conveniently by a crank connected with the piston-rod d^2 of the pump.

Located below the plane of the pump and to one side of the cylinder is an air-cooling apparatus E, the same being supported by and attached to the bottom of the vehicle in any

desired or convenient manner. The cooler is of a height to extend below the bottom of the vehicle, as shown, and is of the following construction: A box of metal or other suitable material of rectangular formation is constructed with a compartment F in the top and a compartment G in the bottom. The compartment F constitutes a distributing-chamber, while the compartment G constitutes a receiving-chamber, and into the former the circulating-pipe *f* leads from the bottom of the jacket of the cylinder, the chamber F being located on a plane below the lowest portion of the jacket of the cylinder, so that gravity alone is depended upon for causing the flow of the water from the cylinder to the chamber. From the compartment G the suction-pipe *d'* leads, the same entering the suction side of the pump D, the outlet of the pipe being adjacent to the bottom of the chamber G. From the pump D the pipe *d* leads into the top of the water-jacket of the cylinder. By this means it will be observed that the water circulating in the compartment G is transferred through the pump D to the top of the water-jacket of the cylinder B and that the water from the cylinder is conducted by gravity into the compartment F.

The construction of the cooler E is conveniently oblong or elongated and the central portion thereof from end to end is open, so that a draft of air may be passed through the space between the chambers or compartments F and G. A convenient manner of forming this portion of the apparatus is to construct the bottom of the compartment F in the form of a series of troughs extending longitudinally. This is accomplished by bending the bottom plate H zigzag or corrugated in cross-section, as shown in Fig. 4. The lower portion or apex of the trough-shaped base is provided with a series of perforations *h*, thus forming openings through which the water discharges into the open space below, and owing to the perforated construction the water is discharged from the compartment F in small streams into the opening space. While the perforated construction is desirable, it is of course to be understood that a narrow slit or other form of small opening can be made, which would serve the purpose of distributing the water from the compartment F in a small stream or streams. The perforations extend throughout the longitudinal length of the base. To gather the water after it passes through the open space in the apparatus and conduct it into the chamber or compartment G, I conveniently construct the upper side or top of the compartment G in a manner similar to that of the bottom of the compartment F, only in a reverse order, thus forming channels or troughs in the wall constituting the top of the compartment G. The water is received in these troughs and conducted down to the apex thereof and passes through suitable perforations *g'* into the compartment G. These perforations are numerous; but it is observed that small slits may be employed in lieu of the perforations. The water passes into the compartment G and is there accumulated and drawn out by the pump, as above stated.

It will be apparent that one of the objects of the invention is to increase the surface area of the water, so that a large amount will come into intimate contact with the air passing through the apparatus. To accomplish this result, various methods may be employed; but I have found that by placing in the space between the two compartments suitable baffle-plates the result is very satisfactory. These baffle-plates are in the form of zigzag diaphragms or partitions J K, one located above the other and of a formation corresponding to that of the bottom of the compartment F and top of the compartment G, differing only in position of the corrugations or zigzag ridges, the same being alternately arranged. The baffle-plate J is provided with a series of perforations in the base of the trough portions, while the apex or higher portions lie directly below the perforations in the bottom plate H of the compartment F. The baffle-plate K has its lower trough portion perforated, the perforations lying directly above the higher portion of the plate *g* of the compartment G, while the higher portions or ridges of the baffle K are arranged directly below the perforations in the baffle J. By this means it will be observed that the water percolating through the perforations *h* of the plate H strikes the inclined sides of the ridges of the baffle J and is conducted down in films to the base or bottom thereof, passing through openings therein, strikes the upper inclined portions of the baffle K, and passes down the inclined sides directly below, this being continued until the water is deposited in the compartment G. The water will therefore be conducted in a zigzag course transversely, and owing to the apertures and their distributer the water will be in the form of films, presenting thereby a large and extended area, with which the air-currents come in contact.

To prevent the water at the ends of the apparatus from flowing out through the open space, suitable flanges are provided at the ends of the baffle-plates and along the upper edge of the corrugated top of the compartment G. These flanges are shown in Figs. 3, 4, 5, and 7 at L, the same conforming in general shape to the zigzag shape of the plates and extending slightly above and below the plane of the intermediate plates and slightly above that of the plate *g*. This effectually prevents the overflow of the water which would be caused by the momentum of the carriage, and so whether the carriage is moving backward or forward. In some instances it may be convenient to omit the flanges from the forward edge of the apparatus.

By the above construction it will be observed that there is a free passage through the cooling device, and as the cooling device is lowered below the bottom of the vehicle the movement of the vehicle will necessarily create a forced draft through the apparatus, the air coming in contact with the water serving to abstract the superfluous heat contained therein, the water being deposited in the compartment G in a cool state. In this connection it is to be observed that the amount of water ordinarily employed is sufficient to fill the tanks F and G and the pipes leading thereto and the water-jacket, so that what little evaporation may take place will be of no material objection, the amount of water being sufficient to prevent the evaporated water interfering with the working of the apparatus and the cooling of the motor-cylinder.

When the water is low, it has been found convenient to distribute the same from the water-jacket to the compartment F through a suitable pipe M, as shown in Figs. 4 and 6, the pipe being provided with a series of branch pipes *m*, all of which are perforated, the branches lying over the respective troughs or corrugations, so that each is provided with a water-supply. This water-distributing feature is important, as it obviously causes a more equal and rapid distribution of the water through the various perforations in the plate H. In Fig. 9 I have shown diagrammatically a modified form of opening in the plates, the same being in the nature of a slit, as suggested above. Other modified forms can be employed, if desired. I have also found it convenient to perforate the sides of the apparatus E, as at *x*, to permit the movement of air therethrough, the perforations conveniently being in line with the central air-space.

To avoid the accumulation of dust, the apparatus is located slightly in advance of the rear wheels of the vehicle and may, if desired, be provided with a screen O at the front, which is carried by the deflector P, located immediately in front of the central air-opening of the cooler E, the screen being located on the outer edge of the deflector. This deflector also serves to conduct the air positively into the open air-space of the cooler.

Any convenient or desirable means may be employed to fill the apparatus with water.

In Fig. 1 I have shown a modified form of structure wherein the bottom plates H′ and G are inclined from edge to edge, there being an open space at their lower edges, through which the water may pass. In this form the baffles J′ are flat oppositely-inclined plates terminating adjacent to one side to form a tortuous passage.

In some instances it may be found necessary to interpose transverse baffles which will prevent the water moving longitudinally the plates by mounting or by air-current. This may be accomplished by securing to the upper faces ribs Q at suitable intervals, as shown in Figs. 4 and 5, the same acting as dams or riffles.

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

1. In a motor-vehicle, the combination with a body and motor carried thereby, of a water-cooler mounted upon the vehicle and having an open-ended cooling-space into which the water is discharged and directly exposed to air-currents created by the movement of the vehicle, means for preventing the water from flowing out of the end of the cooling-space, and means for circulating the water, substantially as described.

2. In a motor-vehicle, the combination with a body and motor carried thereby, of a water-cooler mounted upon the vehicle having an open-ended cooling-space into which the water is discharged, a series of baffles in said space over which the water passes while directly exposed to air-currents created by the movement of the vehicle, and means for circulating the water to and from the motor-jacket, substantially as described.

3. In a motor-vehicle, the combination with a body and motor carried thereby, of a water-cooler mounted upon the vehicle and having an open-ended cooling-space into which the water is discharged, baffles in said space over which the water may pass while directly exposed to air-currents created by the movement of the vehicle, means for preventing the water from flowing out of the end of the cooling-space, and means for circulating the water, substantially as described.

4. In a motor-vehicle, the combination with a body and motor carried thereby, of a circulating system in communication with the motor adapted to contain a cooling medium for said motor, said system having an opening through which the cooling medium may be directly exposed to air-currents created by the movement of the vehicle, substantially as described.

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

EDWARD T. BURROWES.

Witnesses:

HERBERT W. ROBINSON,

FRANK L. RICKER.