

May 10, 1938.

E. O. SCHJOLIN

2,117,040

WATER COOLING SYSTEM

Filed June 18, 1936

5 Sheets-Sheet 1

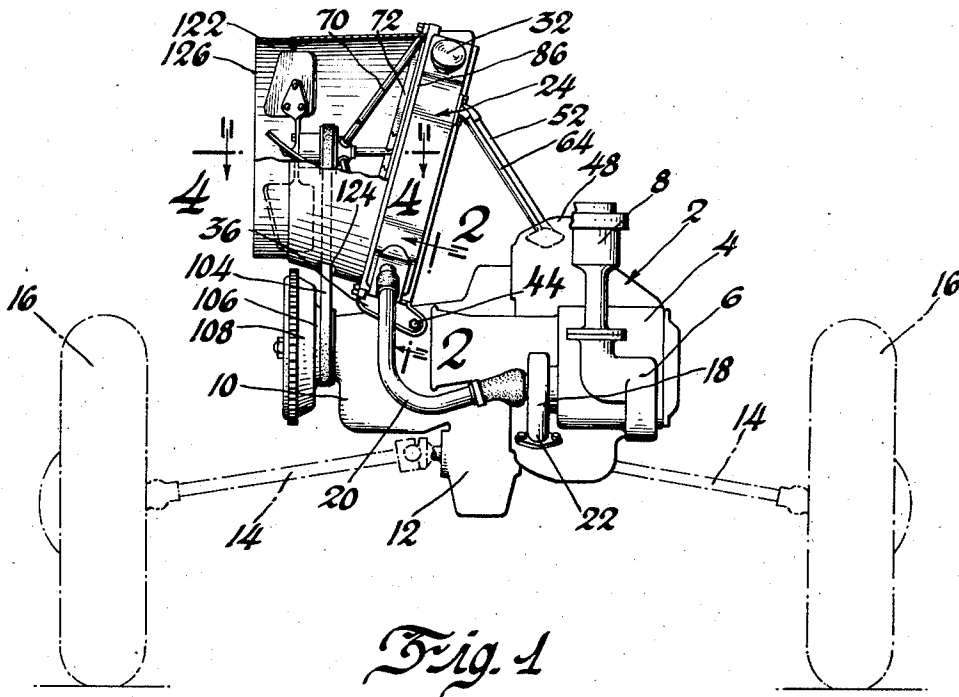


Fig. 1

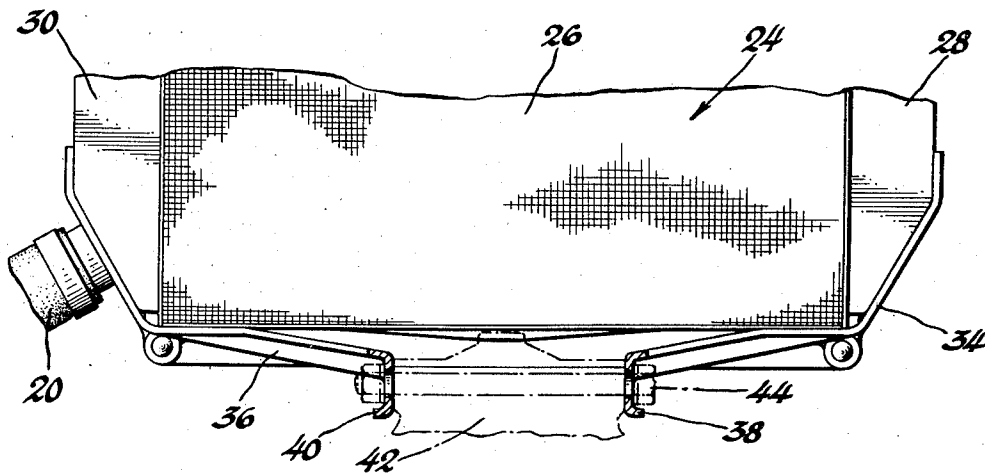


Fig. 2

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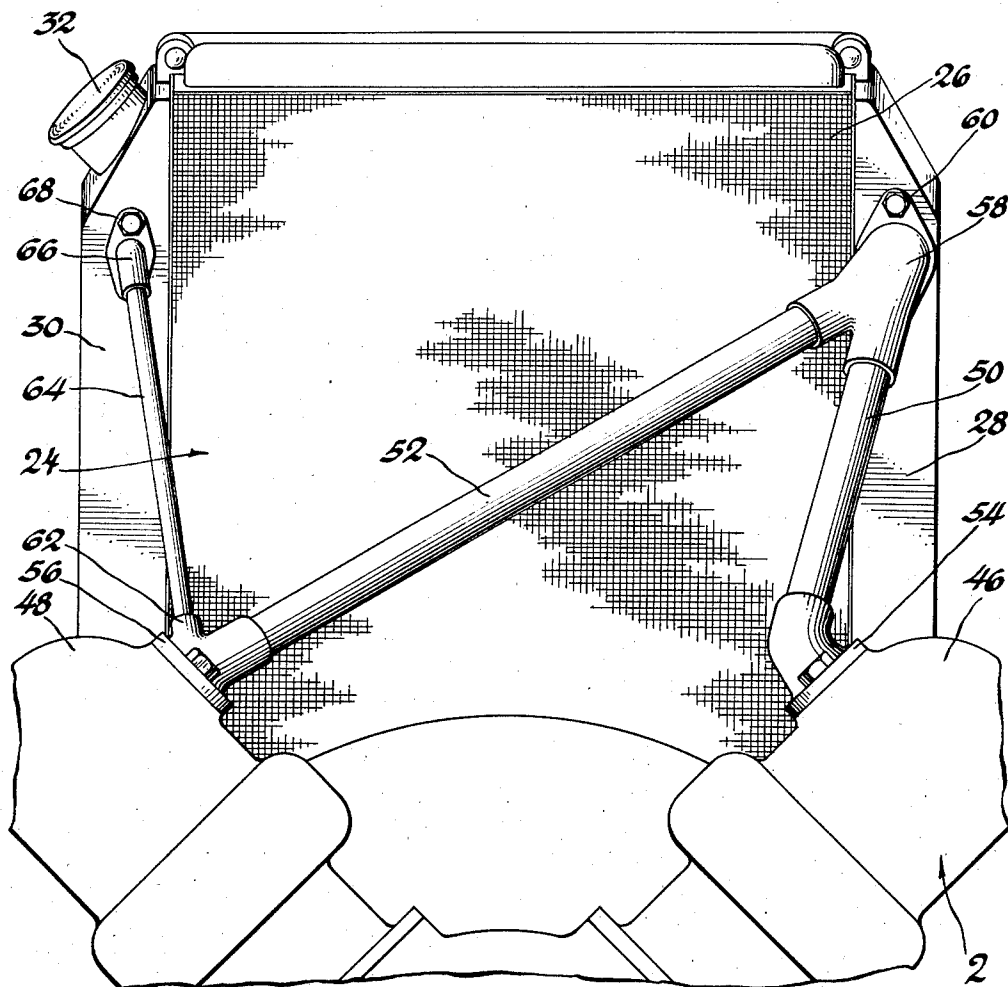
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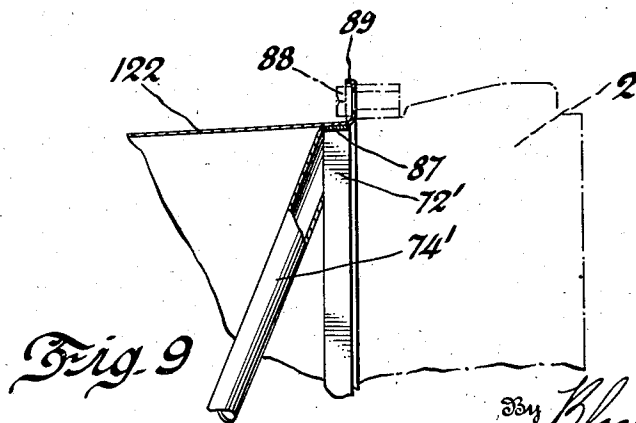
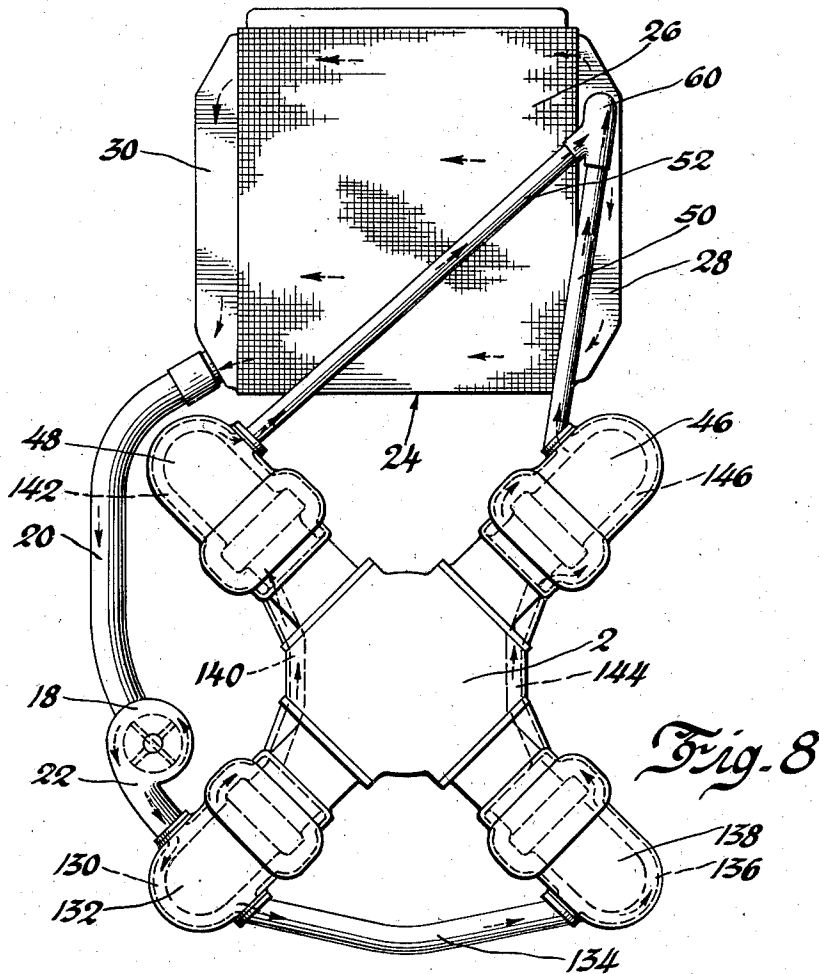
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5 Sheets-Sheet 5

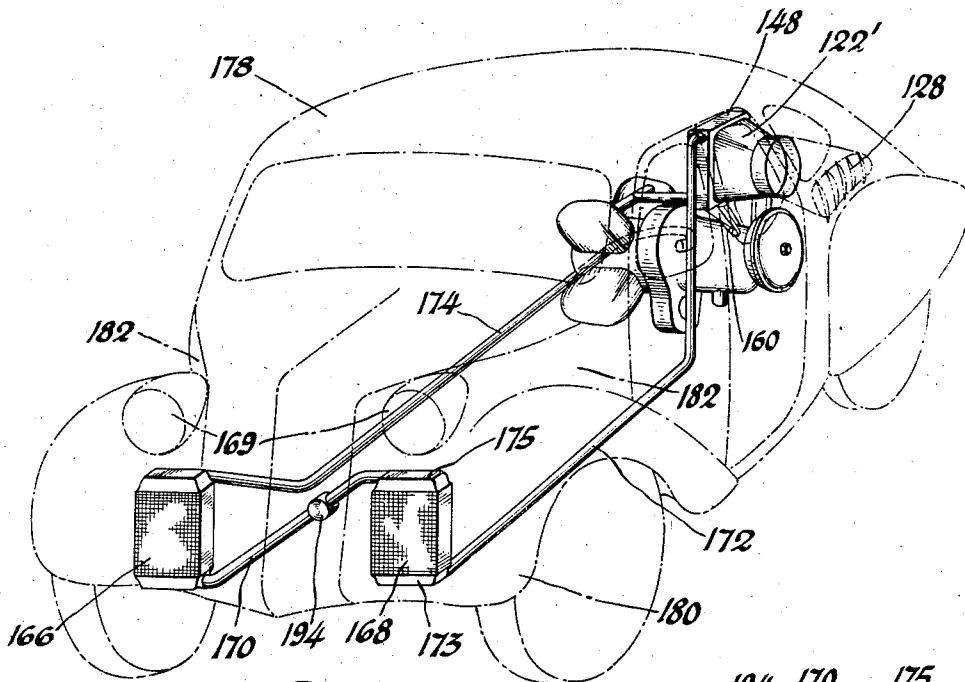


Fig. 10

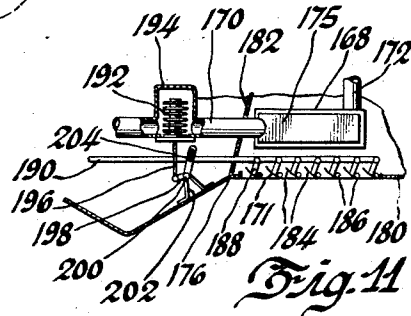


Fig. 11

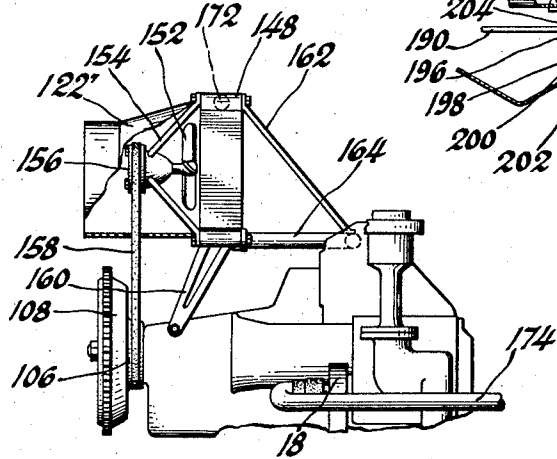


Fig. 12

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UNITED STATES PATENT OFFICE

2,117,040

WATER COOLING SYSTEM

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Application June 18, 1936, Serial No. 85,842

16 Claims. (Cl. 180-54)

This invention relates to improvements in a water cooling system applied to internal combustion engines used on automotive vehicles, and has particular reference to a cooling system as applied to an engine positioned at the rear of the vehicle.

In the prior art where the engine is positioned at the front of the vehicle, it is a relatively easy matter to place the radiator at the front of the vehicle to receive the air as the vehicle passes along the road. Where the engine is positioned at the rear the problem of cooling by radiation by means of a water cooling system becomes more difficult because if the radiator is positioned at the rear of the vehicle close to the engine, there is the problem of causing sufficient air to pass through the radiator to obtain adequate cooling.

One of the means to obtain the necessary quantity of air is to provide louvers in the vehicle side to the rear of the rear door and cause the usual fan to pull the air through the louvers and force it through the radiator. There is some objection to this practice, because where the air is taken inward behind the front of the vehicle, there is considerably more dust from the road taken in by the fan and blown through the radiator and necessarily on the engine in the rear compartment.

This method of cooling has been found satisfactory and gives satisfactory results, but it is more desirable if the radiator can be placed at the front where it is directly in the path of the onward movement of the vehicle and is better situated to take the air through the radiator to cool the water.

In designing the vehicle of the present invention, I found that where the air is taken through louvers at the rear, too great a cooling is obtained in the winter because of the extreme coolness of the air on the outside, and some means must be adopted to restrict the flow of air through the louvers such as by closing a number of the louvers. In the warmer months, a greater quantity of air is required and it is found necessary to reopen the louvers. This brought in the objectionable feature of some adjustment for the louvers. The vehicle of the invention is a relatively light vehicle and has a small engine of the two cycle type and the cooling problems for an engine of this kind are different than for the ordinary four cycle engine. In conducting the experiments for the radiator at the rear, I came upon the idea of placing either one large radiator or two large radiators

at the front of the vehicle and connecting these radiators with pipes to the engine block. I then had the radiators placed directly at the most advantageous position on the vehicle and eliminated the objectionable louvers at the rear. The louvers detracted from the appearance of the vehicle and added to the cost. In practice, I found that by positioning one radiator at the front of the vehicle, I obtained adequate cooling substantially without the use of a fan to draw the air therethrough and by the use of two smaller radiators positioned at the side of the front of the vehicle below the head lamps, I am able to obtain the advantage of a closed compartment or luggage carrier between the radiators at the vehicle front. The two small radiators also adapt themselves much better from the standpoint of appearance design.

Accordingly, the present invention is shown in two species; in one the radiator is positioned at the rear of the vehicle and draws the air through louvers in the vehicle side to the rear of the rear door; in the other species the air is taken at the front of the vehicle through two small interconnected radiators. In this second species I make use of a third small radiator at the rear of the vehicle. This third radiator has a very small fan and has for its object to obtain adequate cooling under certain conditions of operation of the engine, such as during the idling period or when the engine stands for a considerable time with the engine running, etc.

On the drawings,

Figure 1 is a rear elevational view of the engine with the radiator and fan attached, the parts being shown separate from the vehicle but with the rear drive axles and rear wheels shown in dotted outline.

Figure 2 is a detail showing the mounting of the rear end of the radiator on the transmission housing.

Figure 3 is an enlarged detailed view looking from the rear of the radiator and showing the manner in which the water from the engine is delivered to the radiator and the manner of bracing the radiator to the engine.

Figure 4 is a sectional detail showing the mounting of the fan on the framework attached to the radiator.

Figure 5 is an enlarged elevational view showing the radiator on the side opposite to that shown in Figure 3, parts being broken away and shown in section, better to illustrate the details.

Figures 6, 7 and 9 are details of the framework attached to the radiator to mount the fan.

Figure 8 is a detailed view showing the manner in which the water circulates through the engine block and radiator.

Figure 10 is a view in perspective showing the cooling system adapted to a rear engine with the radiating means at the front, with the shutters omitted from in front of the radiators.

Figure 11 is a detailed plan view of one of the radiators of Figure 10 with the shutter attached.

Figure 12 is a detailed view of the third small radiator at the rear of the vehicle.

Referring to the drawings, the numeral 2 indicates an internal combustion engine as a whole.

The engine is of the two cycle type having U cylinders and is provided with a blower the housing of which is indicated at 4. The blower has a by-pass, the housing of which is indicated at 6.

The carburetor is indicated at 8. The engine block has cast integral therewith the transmission housing 10 and the differential housing 12.

Leading from the differential housing are the live axles 14 which drive the rear wheels 16. The usual water pump 18 draws water through a tube 20 from the radiator 24 and delivers it through a pipe 22 into the block of the engine 2.

The radiator 24 comprises the central core 26, the side inlet tank 28 and the side outlet tank 30, all of which are rigidly interconnected in a well known way.

The outlet tank 30 has the filler cap 32 to replenish the water in the cooling system. At the bottom of the radiator there are secured the brackets 34 and 36 having downwardly extending ends 38 and 40.

These ends embrace an upwardly projecting part 42 on a transmission housing and a bolt 44 passes through openings in the ends 38 and 40 and in the projecting part 42 rigidly to mount the lower radiator end.

The upper end of the radiator is mounted as is best shown in Figure 3. Extending from the cylinders 46 and 48 of the engine 2 are the water outlet pipes 50 and 52. These pipes are secured to the cylinders by means of fittings 54 and 56.

and are united at a fitting 58 secured by the flange 60 to the upper portion of the tank 28. The fitting 56 has a boss 62 in which there is screw-threaded a rod 64, the other end of which is secured in a bracket 66 secured by a flange 68 to the upper portion of the tank 30.

The water outlet pipes 50 and 52 and the brace 64 support the radiator at its top.

At the other side of the radiator a framework indicated as a whole at 70 is provided. The framework comprises the inner spider 72 and the outer spider 74. The inner spider comprises four arms interconnected at their centers by the end of a tube 76 as is shown in Figures 4 and 7.

The outer spider also has four arms which are tubular and have slots 78 at the ends of the tubes to receive the ends 80 of the arms of the inner spider 72. This is best shown in Figures 5 and 6.

The ends of the tubes composing the spider 74 are flattened as at 82 and are secured to heads 84 of the frame 86 extending around the periphery of the radiator. The flat ends are secured in place by means of bolts 88. Except as otherwise shown the parts are secured to each other by welding.

Figure 9 shows a modified frame construction. The tubes 74' end at the inside of the hood 122 where they are welded to the squared ends of the inner arms of the spider 72'. The ends of the arms of the spider 72' are flanged as at 87

and welded to the inside of the hood 122. A flange 89 on the hood is held by the bolt 88.

As is seen in Figure 4, the outer spider 74 has a hub 90 which is hollow and receives the other end of the shaft 76. The outer end of the hub is finished to receive a ball bearing 92 on which there is mounted a drum 94 which has secured thereto a second drum 96. The drums 94 and 96 are screwed together by means of a bolt 98.

The drum 94 has the pulley half 100 formed thereon, while the drum 96 has the second pulley half 102 formed thereon, the same to form the grooved pulley to receive the belt 104 driven from the cone pulley 106 formed at the rear of the clutch 108 as described in my co-pending application, S. N. 55,626.

The drums 94 and 96 and the ball bearing 92 are held on the hub 90 by means of the washer 110 and nut 112, the latter being screw-threaded on the threaded end of the hub 90.

The outer end of the hub 96 is returned to form the flange 113 and the fitting 114 is fitted inside the drum. Over the flange 113 there is received the hub 116 of a fan 118. The hub 116 is secured to the flange 113 and fitting 114 by means of the bolts 120.

Surrounding the fan and the spiders 74 and 72 there is a hood 122 which has a slot 124 at its lower portion to enable the fan belt 104 to pass therethrough. The open end or mouth 126 of the hood is placed closely adjacent to the louvers 128 (Figure 10) at the vehicle side so as to enable the fan to draw the most favorable quantity of air and force it through the radiator.

Referring to Figure 8, the manner in which the water circulates through the radiator and the engine is indicated. The pump 18 pulls the water from the tank 30 through the intermediary of the tube 20 and forces it through the pipe 22 into the water passage 130 of the cylinder 132.

From the water passage 130 the water will be divided, part going into the pipe 134 to be delivered to the water passage 136 of the cylinder 138. From the passage 130, the rest of the water will flow into the connecting passage 140 to the water passage 142 of the cylinder 48 and into the outlet pipe 52.

From the passage 136 of the cylinder 138, the water will flow into the connecting passage 144 and into the water passage 146 of the cylinder 46 and into the outlet pipe 50. Both outlet pipes 50 and 52 deliver to the connection 58 and into the inlet tank 28 from where the water is distributed into the radiator to be cooled and flows to the outlet tank 30 to be retaken by the pump and circulated through the engine block. The small arrows in the figure indicate the circulation of the water.

In Figure 10 the same engine is used as shown in Figure 1. There is a radiator 148 positioned at the engine but it is much smaller than the radiator 24 shown in Figure 1. The radiator is provided with a hood 122' and a fan 152 mounted on a spider 154 and driven from the pulley 156 in turn driven by the fan belt 158 operated from the cone pulley 106 on the clutch 108.

The fan 152 is positioned in a different way than the fan shown in Figure 1, but has the same function and if desired the fan and its support may be the same as shown in Figure 1. The radiator is mounted on the transmission housing by means of the supports 160 and is braced to the engine by means of the brace 162. The water pipe 164 serves to pass the hot water from the engine to the radiator 148.

In Figure 10 it will be noted that two small

radiators 166 and 168 are positioned and secured at the front and at the sides of the vehicle immediately below the head lamps 169 and these two radiators are interconnected by the pipe 170 which takes the water from the upper part of the radiator 168 and delivers it to the lower part of the radiator 166. Both radiators 166 and 168 have shutters 171 in front of them as is shown in Figure 11. A pipe 172 connects the lower end of the radiator 168 to the top of the radiator 148 and a third pipe 174 connects the top of the radiator 166 with the pump 18. The pump 18 will draw water from the pipe 174 and force it through the engine block in the manner shown in Figure 8. From the engine block the water will be delivered to the pipe 164. The water will be delivered into the lower end of the radiator 148 and pass upward to the upper tank and be discharged through the pipe 172 to the lower tank 173 of the radiator 168. The water will pass upward into the upper tank 175 of the radiator 168 through the pipe 170 to the lower tank of the radiator 166 through the radiator 166 and then into the pipe 174.

The radiator 148 has a hood 122' which has the same function as the hood 122 in Figures 1 and 5.

As is shown in detail in Figure 11, the shutters 171 in front of the radiators 166 and 168 are mounted in the metal work 176 of the body 178, or where the fenders 180 join on to the sides 182. The shutters include the blades 184, pivotally mounted at 186 and each having at its top an arm 188 to which there is pivotally connected a rod 190 which extends across the vehicle front and connects with the shutter at the opposite side so that both shutters will be simultaneously operated. The vehicle body 178 in constructional detail is described in my copending application Serial No. 41,062, filed September 18, 1935.

The pipe 170 has a thermostat 192 positioned and mounted in a compartment 194 secured in the pipe. An arm 196 from the thermostat is connected to a bell crank lever 198 pivoted at 200 to a bracket 202 secured to the metal work 176 of the body. The other arm of the bell crank lever is slotted and a pin 204 on the rod 190 is received in the slot so that as the thermostat expands the shutters will be moved to open position.

By using two small radiators such as 166 and 168 or one large radiator at the front of the vehicle, I am enabled to take advantage of the movement of the vehicle to cause the air through impact to pass through the radiator. I have found in actual practice that given sufficient radiating surface (as supplied by the two small radiators 166 and 168) I can obtain ample and adequate cooling without the use of a fan or a third radiator such as shown at 148. Under some conditions such as when the engine is idling for a long period, or where the vehicle is going up a long steep grade and perhaps towing a trailer, or where the outside temperature is high (as in midsummer) and there is an insufficient impact of air, there will be a tendency for the engine to overheat because there is insufficient forward movement of the vehicle to cause enough cool air to pass through the radiators. I therefore find it advisable to have a small auxiliary radiator such as 148 with the small fan to give a limited amount of cooling to prevent overheating such as at idling, etc., and to cause a change of air in the engine compartment. The radiator 148 is, however, unnecessary and for a

vehicle which is given the service it receives from the ordinary purchaser, the cooling afforded by the radiators 166 and 168 is ample. Especially in winter the third radiator is unnecessary.

Another reason for using a forwardly positioned radiator is that it brings the hot water from the engine forwardly where it is made available to heat the vehicle, particularly in front of the driver's seat.

In placing the radiator at the sides of the front of the vehicle advantage is taken of the most favorable position to obtain the greatest amount of cooling from the largest and coolest air stream. When the car is moving forward the nose of the car divides the air laterally, upwardly and downwardly, the lateral flow of air striking the vehicle at the head lamps where the radiators are positioned. Experience has shown that the air for about 12 inches above the road is much hotter in summer time by sometimes as high as 30° than the superposed air. With the radiators positioned as shown this stratum of hotter air is avoided because the nose of the vehicle causes it to pass under the car.

I claim:

1. In a cooling system for an internal combustion engine of an automotive vehicle, a combined engine block and transmission housing positioned at the rear of the vehicle, a radiator positioned over the transmission housing and secured thereto, a hood leading from the side of the vehicle to the radiator, means at the side of the vehicle to enable air to enter the hood, a fan in the hood, said fan driven by the engine and adapted to cause air rapidly to pass through the radiator, and a water pump driven from the engine to cause the water to circulate through the radiator and the engine block.

2. In a cooling system for an internal combustion engine of an automotive vehicle, a combined engine block and transmission housing positioned at the rear of the vehicle, a radiator positioned over the transmission housing and secured thereto, a tank at each end of the radiator, means at the side of the vehicle to allow the entrance of air, a hood between said means and the radiator, a fan mounted inside said hood and adapted to cause air rapidly to pass through the radiator, a water pump driven from the engine and adapted to cause the water to pass through the engine block and radiator, and a plurality of pipes leading from the engine and delivering to the tank on one end, said pump withdrawing the water from the other tank.

3. In a cooling system for an internal combustion engine of an automotive vehicle, a combined engine block and transmission housing, a radiator forming a part of the cooling system of the engine and positioned over the transmission and having its lower end mounted thereon, a brace extending from one side of the radiator to the engine block, and a second brace extending from the other radiator side to the engine block to hold the radiator in position.

4. In a cooling system for an internal combustion engine of an automotive vehicle, a combined engine block and transmission housing, a radiator forming a part of the cooling system of the engine and positioned over the transmission and having its lower end mounted thereon, a brace extending from one side of the radiator to the engine block, and a water pipe extending from the other side of the radiator to the engine block to hold the radiator in position.

5. In a cooling system for an internal com-

bustion engine of an automotive vehicle, a transmission housing and an engine block, a radiator over the transmission housing and mounted at its lower end thereon, means to brace the radiator from its two sides to the engine block, a spider secured to the radiator at one of its sides, a rod mounted in the hub of the spider, a bearing on the rod, a fan pulley mounted on the bearing, and a fan driven from the pulley to cause air rapidly to pass through the radiator.

6. In a cooling system for an internal combustion engine of an automotive vehicle, a transmission housing and an engine block, a radiator over the transmission housing and mounted at its lower end thereon, means to brace the radiator from its two sides to the engine block, a four-armed spider secured to the radiator at the corners of one of its faces, a rod mounted in the hub of the spider, a bearing on the rod, a fan pulley mounted on the bearing and a fan driven from the pulley to cause air rapidly to pass through the radiator.

7. In a water cooling system for an internal combustion engine of an automotive vehicle having an imperforate front nose part, fenders at the sides of the nose part, two radiators, one at each side of the nose part and positioned at the extreme forward part of the fenders at the place of junction of the fenders with the nose part and being completely exposed to receive the influx of air when the vehicle is in motion, and means to conduct the water of the system between the engine and the radiators.

8. In a water cooling system for an internal combustion engine of an automotive vehicle having an imperforate front nose part, fenders at the sides of the nose part, two radiators, one at each side of the nose part a short distance to the rear thereof and positioned at the extreme forward part of the fenders at the place of junction of the fenders with the nose part and being completely exposed to receive the influx of air when the vehicle is in motion, and means to conduct the water of the system between the engine and the radiators.

9. In a water cooling system for an internal combustion engine of an automotive vehicle having an imperforate front nose part, fenders at the sides of the nose part, two headlamps, one lamp at each side of the nose part, two radiators, one at each side of the nose part and below a headlamp, said radiators being positioned between the nose part and the fenders, and means to conduct the water of the system between the engine and the radiators.

10. In a water cooling system for an internal combustion engine of an automotive vehicle having an imperforate front nose part extending from the windshield to adjacent the front wheels, two small radiators, one at each side of the nose part, said radiators being completely exposed to receive the influx of air unaided by external means, and means to conduct the water of the system between the engine and the radiators.

11. In a water cooling system for an internal combustion engine of an automotive vehicle, two radiators, one at each side of the front of the vehicle, said radiators being completely exposed to receive the influx of air unaided by external means, a hood at the front of the vehicle extend-

ing between the radiators, the forwardmost part of said hood being imperforate and projecting forwardly of the radiators to divide the air and divert it laterally into the radiators, and means to conduct the water of the system between the engine and the radiators.

12. In a water cooling system for an internal combustion engine of an automotive vehicle, two radiators, one at each side of the front of the vehicle, said radiators being completely exposed to receive the influx of air unaided by external means, imperforate means extending forwardly of and between the radiators to divide the air and divert it laterally into the radiators, and means to conduct the water of the system between the engine and the radiators.

13. In a water cooling system for an internal combustion engine of an automotive vehicle having an imperforate front nose part, fenders at the sides of the nose part, two radiators, one at each side of the nose part and positioned at the place of junction of the fenders with the nose part, shutters in front of both radiators, means interconnecting the shutters to cause their simultaneous operation, and means to conduct the water of the system between the engine and the radiators.

14. In a water cooling system for the internal combustion engine of an automotive vehicle having the engine positioned at the rear end of the vehicle, a plurality of radiators at the front of the vehicle, a water conduit leading from the engine to the top of one radiator, a water conduit leading from the bottom of said one radiator to the top of the second radiator, a water conduit leading from the bottom of the second radiator to the engine, and means to force water through the system.

15. In a water cooling system for the internal combustion engine of an automotive vehicle having the engine positioned at the rear end of the vehicle, a plurality of radiators at the front of the vehicle, a water conduit leading from the engine to the top of one radiator, a water conduit leading from the bottom of said one radiator to the top of the second radiator, a water conduit leading from the bottom of the second radiator to the engine, shutters in front of both radiators, means interconnecting the shutters to enable their simultaneous operation, and means to force water through the system.

16. In a water cooling system for the internal combustion engine of an automotive vehicle having the engine positioned at the rear end of the vehicle, a plurality of radiators at the front of the vehicle, a water conduit leading from the engine to the top of one radiator, a water conduit leading from the bottom of said one radiator to the top of the second radiator, a water conduit leading from the bottom of the second radiator to the engine, shutters in front of both radiators, means interconnecting the shutters to enable their simultaneous operation, a thermostat in the pipe between the radiators and operatively connected with said interconnecting means to cause the operation of the shutters in accordance with the temperature of the water in the cooling system, and means to force water through the system.