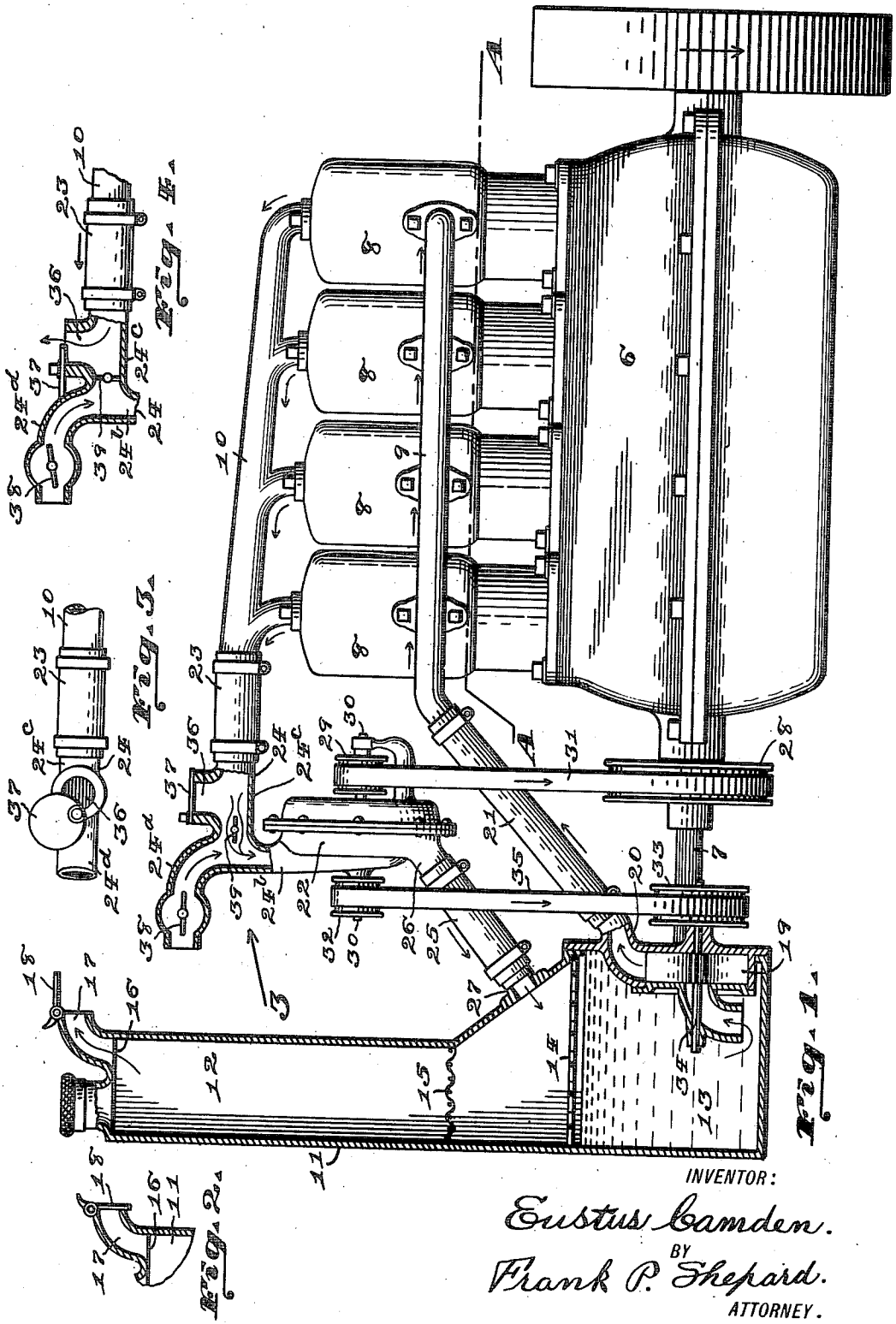
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COOLING SYSTEM FOR INTERNAL COMBUSTION ENGINES.

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1,284,177.

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## COOLING SYSTEM FOR INTERNAL-COMBUSTION ENGINES.

1,284,177. Specification of Letters Patent. Patented Nov. 5, 1918.

Application filed June 11, 1917. Serial No. 174,000.

*To all whom it may concern:*

Be it known that I, EUSTUS CAMDEN, a citizen of the United States, residing at Oklahoma city, in the county of Oklahoma and State of Oklahoma, have invented certain new and useful Improvements in Cooling Systems for Internal-Combustion Engines, of which the following is a specification, reference being had to the accompanying drawings.

The invention pertains to means for cooling internal-combustion engines, and more especially engines used in automobiles.

An object of the invention is to prevent injury to the engine by freezing of the water used for cooling the cylinders.

Other objects and advantages of the invention will be set forth in the ensuing description.

The drawings show one of the practical forms in which the invention may be embodied.

Figure 1 is an elevation view of an automobile engine, and a sectional view of a water-supply tank which is connected in operative relation with the engine.

Fig. 2 is a fragmental reproduction of the upper left-hand portion of Fig. 1, but showing a certain outlet opening closed.

Fig. 3 is a plan view of the parts shown at and around the point indicated by the arrow 3 of Fig. 1.

Fig. 4 is a reproduction of that portion of Fig. 1 at and around the point indicated by the arrow 3, but with certain valves in different position.

Like characters of reference designate like parts in all the figures.

Like the usual automobile engine, the engine shown in this instance includes the main body or crank-case 6; the crank-shaft 7 which is journaled through said crank-case; the cylinders 8 which rest upon and are bolted to the crank-case; the intake water manifold 9 which is common to all the cylinders 8 and bolted thereto; and the outlet water manifold 10 which is common to all the cylinders and bolted thereto.

The manner in which the water passes from the intake manifold 9 through the several cylinders 8 to the outlet manifold 10 is well known, as is also the fact that heretofore the water in the tank, radiator, or other source of cold-water supply is maintained at such level as to keep the cylinder walls practically submerged at all times, whether the engine is running or not.

In the present instance, the inventor dispenses with the honey-comb radiator commonly employed and uses the simple tank 11 shown; the lower portion of this tank being adapted to contain the water required and store said water below the line of the lowest water-containing portion of the cylinders 8, for example, below the line A—A of Fig. 1.

The upper portion 12 of the interior of the tank 11 is in permanent communication with the lower or water-containing portion 13, except as partially separated from said lower portion 13 by a perforated diaphragm 14 and by a screen 15 which are employed to prevent undue splashing of the water from the motion of the automobile.

This perforated diaphragm 14 and screen 15, while preventing excessive splashing of the water, act to nebulize or atomize the water and thereby aid evaporation and cooling of the water; and the upper wall 16 of the tank 11 is provided with an opening 17 which may be left open for escape of heat and vapor.

In further arrangement, a small pump 19, which may be of the well known centrifugal type, is located in the lower part of the tank 11 and adapted to drive water from said tank to the intake manifold 9, the outlet nozzle 20 of the pump being connected to the intake manifold 9 by the usual flexible connection 21.

A second centrifugal pump 22 is located above the line A—A and adapted to forcibly conduct the water from the outlet manifold 10 back to the tank 11, a flexible connection 23 being used to connect the manifold 10 with the intake pipe 24 of the pump 22 while a similar flexible connection 25 connects the outlet nozzle 26 of said pump to a nipple 27 on said tank.

In arranging to drive the pumps 19 and 22, a belt-wheel 28 on the crank-shaft 7 of the engine imparts motion to a smaller belt-pulley 29 on the shaft 30 of the pump 22 through a belt 31; and a small belt-pulley 32 on the shaft 30 of said pump imparts motion to a belt-wheel 33 on the shaft 34 of the pump 19 through a belt 35.

With the parts arranged as described, water from the lower part of the tank 11 is drawn up by the pump 19 and forced

up through the connection 21; through the intake manifold 29; through the cylinders 8; through the outlet manifold 10; through the connection 23; through the pump 22; and back through the connection 25 into the tank 11 above the diaphragm 14.

In delivering the water back into the tank 11 on top of the perforated diaphragm 14 the water is atomized or nebulized into condition to more readily vaporize and cool, the vapor and heat rising and passing out the opening 17 previously described.

It will be noted that the intake pipe 24 of the upper pump 22 projects upward from the body of said pump as at $24^b$ and then rearward as at $24^c$ to meet the connection 23 and that the rearward portion

With the outlet opening 17 at the upper end of the tank 11 closed, the air forced into the tank is forced through the pump 19 and on up into the cylinders 8 through the water circuit, the air passing out of the cylinders through the outlet manifold 10 and through the open outlet 36.

It will be seen that by closing the valves 37 and 38 to exclude all air, and at the same time leaving the valve 39 open, an exclusive water circuit may be formed, with the cylinders 8 as a part of said circuit; and that, on the other hand, by removing the belt 35 and stopping the pump 19, and at the same time opening the valve 38 and closing the valve 39 an exclusive air circuit is formed.

the air passing in at the valve 38 down

ders, a water circuit including said cylinders and a water supply, the water supply being positioned below the level of the cylinders, circulation means in the water circuit, an air circuit, the water circuit and air circuit being merged into a single circuit along a portion of their length, circulation means in the merged portion of the circuits, the circulation means in the merged portion of the circuits being of greater capacity than the circulation means in the water circuit.

5. In a cooling system for engine cylinders, a water circuit including said cylinders and a water supply, the water supply being positioned below the level of said cylinders, a pump in the water supply for producing circulation of the water in the water circuit, an air circuit, the water circuit and air circuit being merged into a single circuit along a portion of their length, a pump in the merged portion of the circuits and of greater capacity than the pump in the water supply, the water supply comprising a tank into which the merged portion of the two circuits discharges, a perforated diaphragm arranged in the tank in position to receive the discharge of the merged portion of the two circuits, the tank being extended upward from the diaphragm and being provided with an outlet opening above said diaphragm.

Witness my hand this 6 day of June, 1917.

EUSTUS CAMDEN.