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AUTOMATIC RADIATING SYSTEM FOR INTERNAL COMBUSTION ENGINES.

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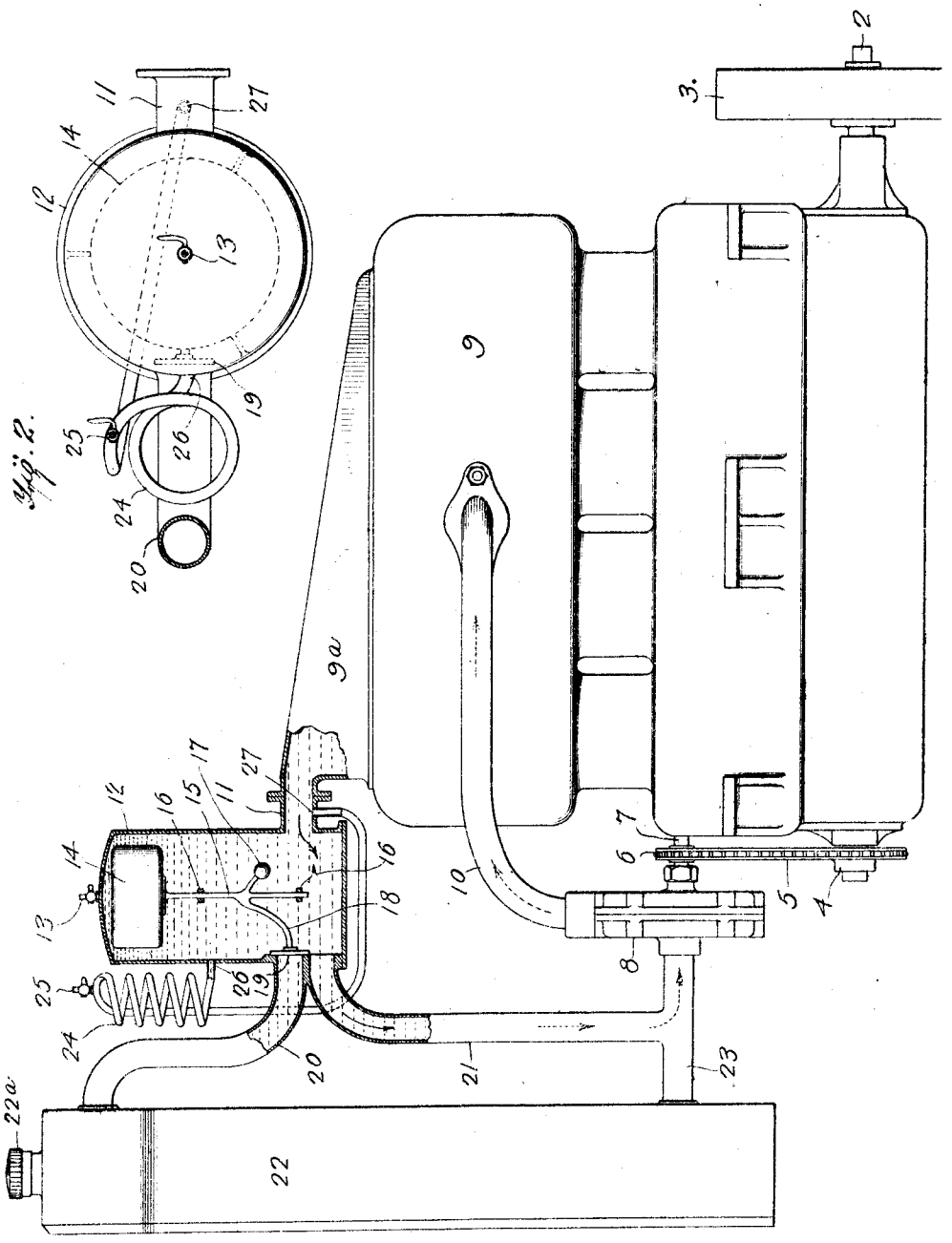



Fig. 2.

Fig. 1.

WITNESSES

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## AUTOMATIC RADIATING SYSTEM FOR INTERNAL-COMBUSTION ENGINES.

1,104,552. Specification of Letters Patent. Patented July 21, 1914.

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*To all whom it may concern:*

Be it known that I, EUGENE A. SAYRE, a citizen of the United States, and a resident of Elgin, in the county of Kane and State of Illinois, have made certain new and useful Improvements in Automatic Radiating Systems for Internal-Combustion Engines, of which the following is a specification.

My invention relates to improvements in automatic radiating systems for internal combustion engines, and it consists in the combinations, constructions and arrangements herein described and claimed.

It is a well known fact that an internal combustion engine operates more efficiently if the parts are heated to a certain temperature, than it does if these same parts are cold. On the other hand, the parts may be heated to such a temperature as to result in injury to the engine. The ordinary systems of cooling by radiation, in which water circulation is used, employ means for forcing the water into contact with the cylinder of the engine, and thence through a radiator, returning the cooled water to the engine, and thus completing the cycle. In those forms in common use the movement of the water from the heated cylinder to the radiator begins at the first stroke of the engine, and the consequence is that the cold water flowing in around the cylinder keeps the temperature of the engine down below that at which it works most efficiently. After the engine has run for awhile it will gradually heat up and thus it is that an engine, for instance in an automobile, will work better after being run for some time than it will at first.

An object of my invention is to provide a radiating system in which the heat of the engine may be retained until it has reached such a degree as to insure its most efficient working, after which a circulation of water or of other cooling medium is automatically started through the radiator, thereby tending to keep the engine from overheating.

A further object of my invention is to provide a system of the type described in which the water may be circulated either through the radiator or through a by-pass, the effect of the circulation through the by-pass being to conserve the heat so as to enable the engine to quickly attain the temperature of its maximum efficiency.

A further object of my invention is to provide thermostatic means for operating valves to control the flow of water either through the radiator or through the by-pass.

Other objects and advantages will appear in the following specification, and the novel features of the invention will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings forming part of this application in which—

Figure 1 is a side view showing an engine, a radiator, and thermostatic means for controlling the flow of the cooling fluid, and Fig. 2 is a plan view of the float-tank.

Referring now particularly to Fig. 1, I have shown therein, diagrammatically, an internal combustion engine 1 of any suitable type, provided with a main shaft 2 having a fly wheel 3 at one end and provided at the other end with a sprocket wheel 4, which is connected by a sprocket chain 5 with a sprocket 6 on a stub-shaft 7. The latter is directly connected with a pump 8. At 9, I have shown a water jacket which is connected by a pipe 10 with the pump 8. An extension $9^a$ of the water jacket communicates by a pipe 11 with a float chamber 12, having a cock 13 at its top. Within the float chamber is an air filled float 14 having a stem 15 slidingly disposed in guides 16. Secured to the stem is a weight 17, on one side, and an arm 18 bearing a slide valve or gate 19 arranged to open or close the ends of a pair of pipes 20 and 21. The pipe 20 leads to the top of the radiator 22 and the pipe 21 connects with a pipe 23 leading from the bottom of the radiator directly to the pump 8.

At 24 is a condenser having a cock 25 at its top. One end of this condenser communicates with the interior of the float chamber 12 at 26, while the other end connects with the pipe 11 at 27.

From the foregoing description of the various parts of the device the operation thereof may be readily understood.

The radiator is filled with the cooling liquid, preferably water and the cocks 13 and 25 are opened until all the air is expelled from the float chamber 12 and con-

denser 24 and the chamber and condenser are completely filled with the liquid. Care is taken to supply enough liquid to completely fill the radiator and the water jacket. This is accomplished through the cap $22^a$. As the radiator is filled the float 14 rises and the valve 19 is brought into position so as to cut off the flow through the pipe 20. When the engine is started the pump 8 will begin to work, and will cause a circulation of the water through the pipe 10, through the water jacket 9, and its extension $9^a$, the float chamber 12, and by means of the by-pass and pipe 23 back to the pump 8. It will thus be seen that this initial flow does not pass through the radiator. The consequence is, that, as the engine continues to run, the water becomes heated to its boiling point.

On reaching its boiling point the vapor will begin to enter the float chamber, and as it does so it collects at the top and gradually forces the float 14 downwardly, thereby tending to uncover the pipe 20 and to close the pipe 21. The uncovering of the pipe 20 permits part of the fluid to flow around through the radiator. If the generating of steam is fast, in other words if the heat of the engine is increasing, the float will be pushed down farther, and more of the liquid will be forced around through the radiator. A point will be reached where the radiation will approximately balance the generation of steam, and at this point the float will remain stationary. If the load on the engine increases and the temperature rises, the float will be pushed farther down while on the contrary if the amount of cool water supplied to the water jacket is in excess of the amount required, then the temperature will fall and the steam in the top of the water jacket 12 will condense, thereby permitting the float to rise. A part of the fluid will now be turned around through the by-pass 21 and shut off from the radiator 20.

It will thus be seen that the device is automatic, and is controlled by the vapor of the cooling medium.

In case the production of the vapor should be too fast the condenser 24 comes into play. This condenser is designed to be filled with the cooling fluid when the radiator is being filled, the cock 25 being opened for that purpose and closed after the condenser is filled. As long as the liquid in the float chamber keeps above the opening 26 the condenser is idle, but when steam begins to enter at the opening 26, the cool liquid in the condenser is forced from the condenser through the opening 27 into the pipe 11 where it meets the incoming steam and tends to condense it.

It will be seen that I have provided a cooling system by means of which the initial heat of the engine is saved in order to enable it to at once attain its maximum efficiency. This heat is otherwise lost and more fuel is needed in a device which does not automatically regulate the flow of the cooling fluid as set forth in the foregoing specification.

The use of my improved system results in a gain of power, since the cylinders are working at an even and more effective temperature. It also prevents the excessive radiation that takes place in cold water where a non-thermostatic system is used.

I am aware that other forms of the device based upon the same general plan of operation might be provided, but I consider as my own all such modifications as fairly fall within the spirit and the scope of the invention.

I claim:—

1. In a radiating system for internal combustion engines, the combination of an engine having a jacket, a radiator, pipes connecting the radiator and the jacket, a by-pass between said pipes, a cooling liquid for circulation through said jacket and said radiator, a valve for proportioning the flow of cooling liquid through said by-pass and said radiator, and means operated by the vapor pressure of the cooling liquid for controlling the movement of the valve.

2. In a radiating system for internal combustion engines, the combination of an engine having a jacket, a radiator, pipes connecting the radiator and the jacket, a by-pass between said pipes, a cooling liquid for circulation through said jacket and said radiator, a pressure chamber for receiving the vapors of the cooling liquid, a closure for said by-pass and one of the pipes leading to the radiator, and means operated by the vapor pressure of the cooling liquid for controlling the movement of said closures.

3. In a radiating system for internal combustion engines, the combination of an engine having a jacket, a radiator, pipes connecting the radiator and the jacket, a by-pass between said pipes, a cooling liquid for circulation through said jacket and said radiator, a pressure chamber for receiving the vapors of the cooling liquid, a closure for said by-pass and for one of the pipes leading to the radiator, both of said closures being on a common movable operating rod, the movement of said rod serving to open one of said closures and to close the other, and means operated by the vapor pressure of the cooling liquid for controlling the movement of the rod.

4. In a radiating system for internal combustion engines, the combination of an engine having a jacket, a radiator, pipes connecting the radiator and the jacket, a by-pass between said pipes, a cooling liquid for circulation through said jacket and said radiator, and means operated by the vapor pressure of the cooling liquid for propor-

tioning the flow of cooling liquid through said by-pass and said radiator.

5. In a radiating system for internal combustion engines, a radiator adapted to receive a cooling liquid, a jacket inclosing the cylinder of the engine, connections establishing communication between the top of the jacket and the top of the radiator, connections establishing communication between the bottom of the radiator and the jacket, a by-pass between the connections at the top and bottom of the radiator, a pump for causing a circulation of the cooling medium through the jacket, the radiator and the by-pass and thermostatic means dependent on the vapor pressure of the cooling medium for automatically controlling the flow of the cooling medium through the radiator and the by-pass.

6. In a radiating system for internal combustion engines, a radiator adapted to receive a cooling liquid, a jacket inclosing the cylinder of the engine, connections establishing communication between the top of the jacket and the top of the radiator, connections establishing communication between the bottom of the radiator and the jacket, a by-pass between the connections at the top and bottom of the radiator, a pump for causing a circulation of the cooling medium through the jacket, the radiator and the by-pass, thermostatic means dependent on the vapor pressure of the cooling medium for automatically controlling the flow of the cooling medium through the radiator and the by-pass, said means comprising a float chamber forming part of the connection between the top of the water jacket and the radiator and arranged to be filled with the cooling medium, a float disposed therein, and means controlled by the float for opening and closing the connection to the top of the radiator and the by-pass.

7. In a radiating system for internal combustion engines, the combination of an engine having a jacket, a radiator, a cooling liquid for circulation through said jacket and said radiator, a pipe connecting the bottom of the radiator with said jacket, a vapor pressure chamber connected with the top of said jacket, and means controlled by the vapor pressure of said fluid cooling medium for establishing communication between said vapor pressure chamber and the upper portion of the radiator.

8. In a radiating system for internal combustion engines, the combination of an engine having a jacket, a radiator, a cooling liquid for circulation through said jacket and said radiator, a pipe connecting the bottom of the radiator with said jacket, a vapor pressure chamber connected with the top of said jacket, means controlled by the vapor pressure of said fluid cooling medium for establishing communication between said vapor pressure chamber and the upper portion of the radiator, and a condenser normally filled with the cooling fluid and having one end in communication with said pressure chamber, the other end of the condenser being connected with the pipe which establishes communication between the pressure chamber and the jacket of the engine.

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