April 29, 1924. 1,492,437

C. M. DOWELL.

AUTOMATIC SHUTTER CONTROLLED APPARATUS FOR THE RADIATORS OF INTERNAL COMBUSTION ENGINES

Filed April 3, 1917 2 Sheets-Sheet 1

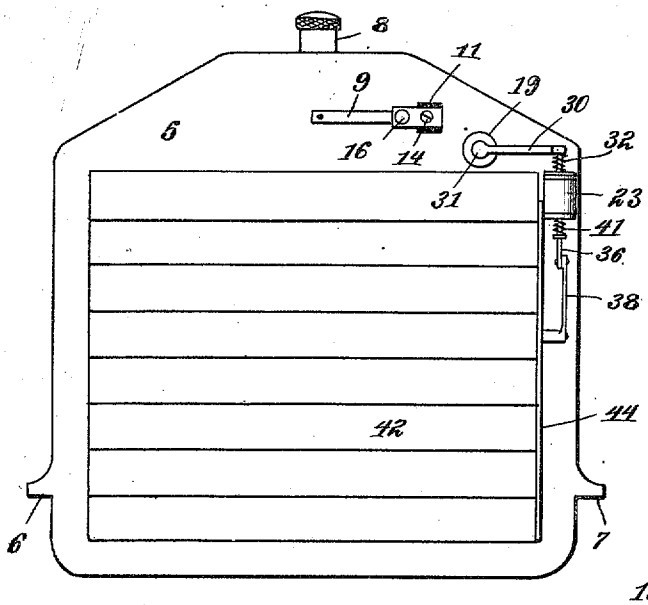


Fig. 1

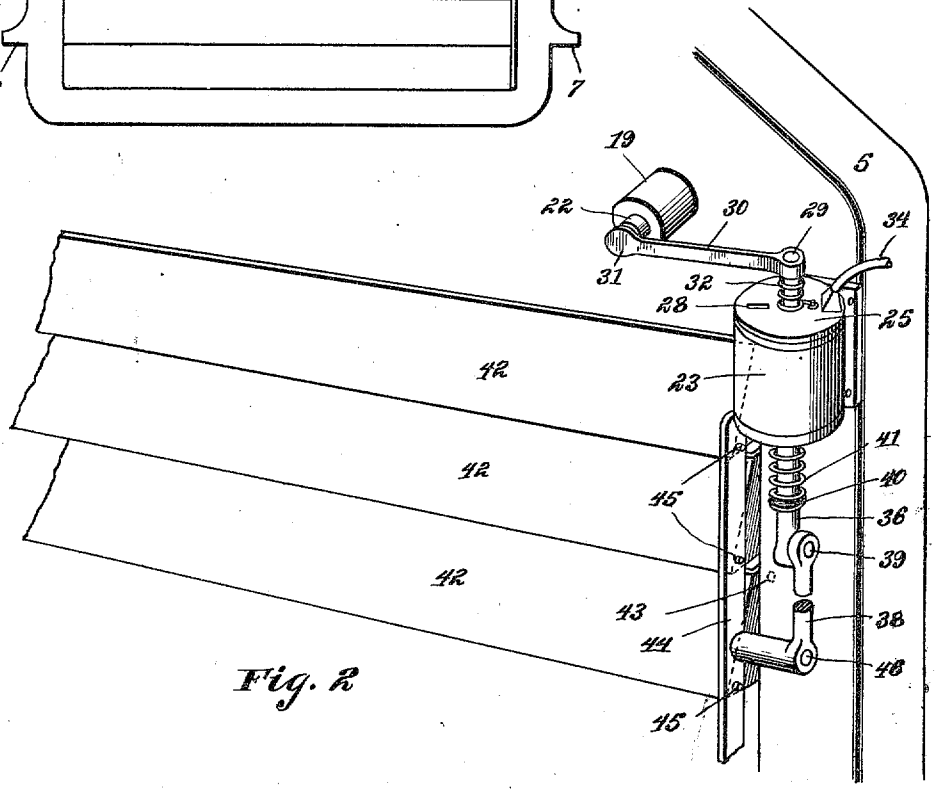


Fig. 2

INVENTOR

C. M. Dowell,

WITNESSES

E. F. Rudolph

H. G. Pierson

BY Victor J. Evans

ATTORNEY

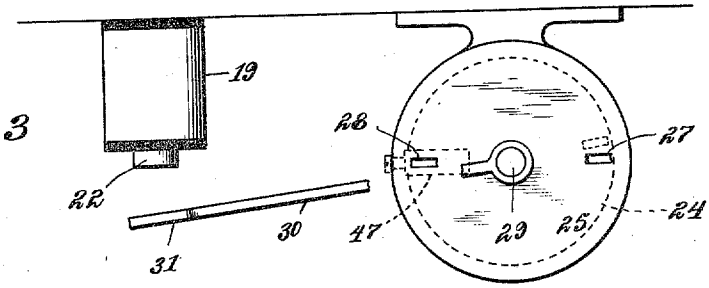
April 29, 1924. 1,492,437

C. M. DOWELL

AUTOMATIC SHUTTER CONTROLLED APPARATUS FOR THE RADIATORS OF INTERNAL COMBUSTION ENGINES

Filed April 3, 1917 2 Sheets-Sheet 2

Fig. 3



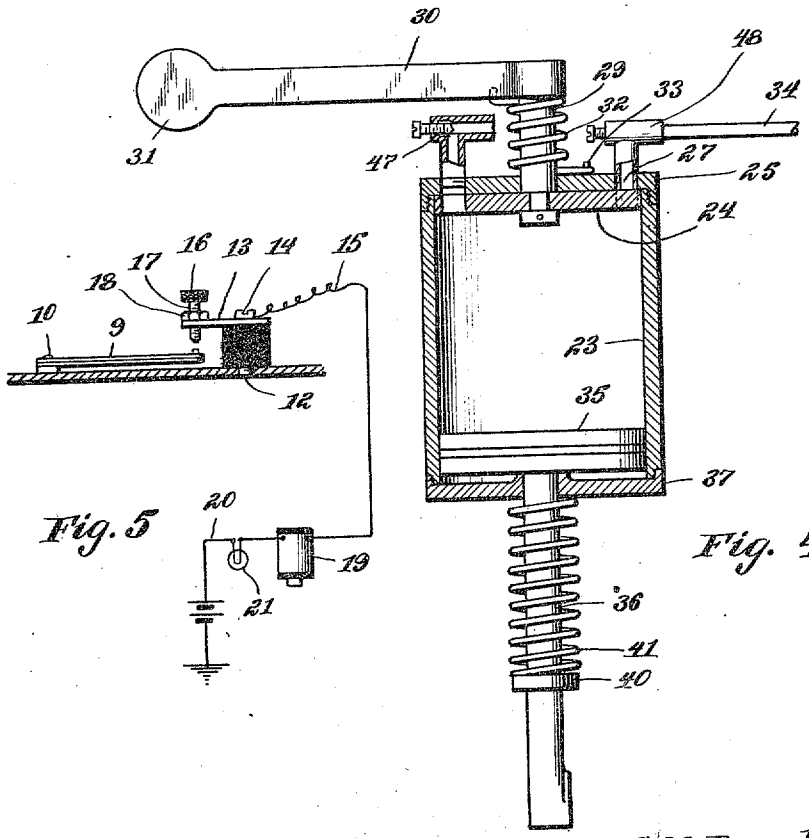


Fig. 5

Fig. 4

INVENTOR

C. M. Dowell,

BY Victor J. Evans

ATTORNEY

WITNESSES

C. F. Rudolph

H. G. Pierson

Patented Apr. 29, 1924. 1,492,437

UNITED STATES PATENT OFFICE.

CHESTER M. DOWELL, OF HUNTINGBURG, INDIANA, ASSIGNOR TO HERBERT R. LEWIS, OF DETROIT, MICHIGAN.

AUTOMATIC SHUTTER-CONTROLLED APPARATUS FOR THE RADIATORS OF INTERNAL-COMBUSTION ENGINES.

Application filed April 3, 1917. Serial No. 159,496.

To all whom it may concern:

Be it known that I, CHESTER M. DOWELL, a citizen of the United States, residing at Huntingburg, in the county of Dubois and State of Indiana, have invented new and useful Improvements in Automatic Shutter-Controlled Apparatus for the Radiators of Internal-Combustion Engines, of which the following is a specification.

This invention is an automatic shutter controlled apparatus for the radiators of internal combustion engines.

As a rule a self-propelled vehicle is not provided with any means whereby the temperature of the cooling water may be maintained at a predetermined degree. It is well known that the proper operation of an internal combustion engine is dependent upon the heat of the cooling water. It must neither abstract too much heat from the cylinder walls, nor must it permit the cylinder walls to get too hot.

In the usual construction of self-propelled vehicles, the radiator, which is composed of a large number of radiating surfaces, is placed at the forward end of the vehicle, and, especially in winter time, some means must be provided to prevent too much air from passing through and over the radiating surfaces. This is usually done by providing a hood cover, which includes a radiator cover having a flap which turns down and obstructs the passage of the air over the radiating surfaces.

In the practical usage of the hood cover and the radiator cover, and especially when alcohol is put into the cooling water on warm days, one must remove a greater portion of the cover. This is a disadvantage, as one must be on a constant look-out for changes in temperature.

Broadly stated, the invention comprises a thermostat adapted to open and close, a circuit leading to an electro-magnet, a cylinder and a piston operable therein, the cylinder being provided with two heads, one of which is movable, and both heads being provided with ports which may be brought into registration, the movable head being adapted to be actuated by the electro-magnet, and one of the said ports being connected to the intake manifold of the engine and the other port being adapted to permit air to have access within the cylinder, said movable head being provided with means to maintain the air ports in registration, the piston being provided with a rod which extends through another head, a collar on said rod, and a spring interposed between said latter head and the collar, a shutter adapted to be positioned adjacent the radiator to regulate the amount of air passing therethrough, and means to connect the piston rod with the shutter to actuate the same.

One practical form of the construction will be described and illustrated in the accompanying drawings, in which:—

Figure 1 is a front elevation partly in section, showing the assembly in connection with the radiator;

Figure 2 is a perspective view, showing the shutter operating mechanisms;

Figure 3 is a perspective view of a movable head, stem and arm, illustrating the ports; and

Figure 4 is a vertical sectional view through the cylinder heads.

Fig. 5 is a diagram of the electric circuit containing the electromagnet.

The radiator, as shown in Figure 1, is of the usual or customary type, as employed upon self-propelled vehicles and in aeroplane work, and comprises the shell portion 5 and the attaching lugs 6 and 7, and the customary filling cap 8. The radiating surfaces (not shown) may be of the usual formation. The shutter operating mechanism, if so desired, may be built into the shell 5, as shown in Figure 1. Mounted upon the upper portion of the shell 5 is a thermostat provided with a movable bar 9 formed of dissimilar metals having different co-efficients of expansion. One end of this bar may be fastened to the metal shell of the radiator in any approved manner, the point of connection being indicated at 10. Spaced from the free end of this bar 9 is an insulating block 11, which may be composed of fiber or hard rubber, and is secured to the shell by means of the screws 12. Mounted upon the upper side of this block 11 is an arm 13, which is secured to this block 11 by means of a screw 14. This screw 14 also provides a connection for one terminal of the wire, indicated at 15. The outer end of this arm or bar 13 is provided with an

aperture through which passes a threaded screw having a flat head 16, a threaded stem 17, and is further provided with a lock nut 18. The free end of the threaded portion 17 is adapted to contact with the free end of the bar 9 when this latter bar rises due to the rise in temperature, and thus completes the circuit, as will be shown hereafter.

The wire 15, which forms a part of the circuit, leads from the screw 14 to one terminal of the electro-magnet 19. Another terminal of the magnet 19 is connected by means of the wire 20 to a suitable source of electrical energy, which may include in its circuit a pilot lamp 21. This pilot lamp 21 is used for two purposes, one to show the operation of the circuit, and also to limit the amount of current passing therethrough to the magnet 19. The magnet 19 may be attached to the radiator shell 5 in any secure manner, and is provided with a projecting core 22.

The cylinder 23 is provided with two heads 24 and 25, and each of these heads are provided with registering openings indicated at 27 and 28, as formed in the head 24. The head 24 is adapted to be rotated, and for this purpose is provided with a stem 29 to which is connected an arm 30.

The arm 30 carries at its outer end an armature 31, which is adapted to cooperate with the core member 22 of the magnet. To maintain the head 25 in a predetermined position so that the slots 28 formed in the heads will register, a spring element 32 is shown as having one end secured to a pin 33 while the other end of the spring is secured or contacts with the arm 30. The torsion of this spring tends to bring the ports 28 into line and thereby register. When these ports 28 register, they admit air into the interior of the cylinder 23.

The port 27 formed in the head 25 is adapted to be directly connected with the intake manifold of the internal combustion engine by means of the pipe or tube 34. When the head 24 is in its normal position and the ports 28 are open to the air, the ports 27 formed in the heads 24 and 25 do not register, but when, as the engine continues to run, the water in the cooling system abstracts the heat from the cylinder walls and becomes warmer and the thermostat operates to close the circuit though the electromagnet 19, the armature 31 is attracted which moves the ports 28 out of registration and the ports 27 into registration, whereupon the suction created by the intake manifold exhausts the air from within the cylinder 23, and causes the piston 35 to rise. The piston 35 may be formed in any usual or customary manner, and is provided with a rod 36, which projects through a head 37. The lower end of the rod 36 is shown as being formed so as to have a pivotal connection with the link 38. The pivotal connection may be of any usual type, and is here shown as being formed of two eyes through which passes a pin 39. This pin may be secured in any suitable manner. Disposed at some point intermediate between the head 37 and the eyes there is a collar 40 which may be secured to the rod 36 in any usual manner. Interposed between the head 37 and this collar and surrounding the rod 36 is a spring element 41 which tends to move the piston 35 downward when air is admitted through the ports 28 to the interior of the cylinder 23.

The shutter which is positioned adjacent the front of the radiating portion of the radiator is provided with a plurality of movable slats 42 through the pivotal mounting indicated at 43. In order to rotate these several slats 42 around the axis, the actuating bar 44 is provided, which has suitable connections with each one of the elements 42 as indicated at 45. The point of connection is preferably spaced from the pivotal connection 43 so that the slats may be rotated simultaneously. To connect the actuating bar 44 with the piston rod 36, the link 38 was provided and is shown as having a pivotal connection with the actuating bar 46.

In practical usage, when this device is employed on a self-propelled vehicle, the bar 9 is maintained out of contact with the threaded stems 17 and the circuit is broken through the electro-magnet 19. This condition obtains when the motor and the water in the circulating system is cool. At the same time, the shutter is also closed, and prevents the passage of air through and over the radiating surfaces of the radiator.

When the engine is started up and runs, the water circulates and abstracts heat from the cylinder walls, passing upward from the water jacket to the upper portion of the radiator shell 5. The longer the engine continues to run with the shutter closed, the quicker the water will become hot, effecting the prompt closing of the circuit by element 9. When the temperature of the water reaches a predetermined point, the bar 9 will contact with the end of the threaded portion 17, thereupon closing the circuit through the electro-magnet 19. The energizing of the electro-magnet will produce a pull through the ends of the core 22, the connected arms then acting to draw the arm 31 close to the core 22. This rotates the head or valve 24 about its axis, which closes the ports 28 and opens the ports 27, whereupon the suction produced in the intake manifold exhausts the air from within the cylinder 23. The exhaustion of the air produces a slight vacuum and this vacuum causes the piston 35 to rise against the action of the spring 41. As the piston rod 36 moves upward, it communicates its motion

to the shutter, and its slats 42, by means of the link 38. Thus when the shutter is open, the air will have free passage through and over the radiating surfaces of the radiator, which will tend to cool the water of the circulating system. After the thermostat has been once adjusted for a particular temperature rise, the device will be automatic in its operation and the opening and closing of the shutter will be dependent entirely upon the temperature of the water in the circulating system, and the suction produced by the engine from the intake manifold.

In order to provide for control of the air entering the cylinder 23 through the ports 28, a valve 47 may be employed, and to control the movement of the piston 35 in the cylinder 23, by the engine suction, another valve 48 may be used. As shown it is disposed in the port 27 so that it may be connected with the pipe 34, leading from the intake manifold. The valves may be of any usual or customary type, and are shown as being of the needle type.

Minor changes in the form, proportions, and details of construction may be resorted to without departing from the spirit of the invention or from the scope of the appended claims.

Subject matter relating broadly to controlling the cooling capacity of the radiator, shown, but not claimed in this application, is made the subject-matter of my co-pending application Serial No. 701,995, filed March 26, 1924.

I claim:—

1. The combination of an internal combustion engine, a cooling system therefor including a radiator, movable means positioned adjacent the radiator for controlling the flow of air through the radiator, and means directly responsive to suction produced in the engine cylinders for actuating said movable means.

2. The combination of an internal combustion engine, a cooling system therefor including a radiator, means for controlling the flow of air through the radiator, said means comprising a shutter device associated with the radiator, and means directly responsive to suction produced in the engine cylinders for actuating said shutter device.

3. The combination of an internal combustion engine, a cooling system therefor including a radiator, means for controlling the flow of air through the radiator, said means comprising a shutter device associated with the radiator, means directly responsive to suction produced in the engine cylinders for actuating said shutter device, and a thermostatic device governing the operation of the means responsive to suction.

4. The combination of an internal combustion engine, a cooling system therefor including a radiator, means for controlling the flow of air through the radiator, said means comprising a shutter device associated with the radiator, a motor adapted to actuate said shutter device, said motor being connected to the intake of the engine and adapted to be actuated by the suction of said engine in said intake.

5. The combination of an internal combustion engine having a water circulation cooling system therefor including a radiator, means for regulating the flow of air through the radiator, said means comprising a shutter device associated with the radiator, a plurality of means, one of which is operable by the temperature of the cooling water and another operable by the suction produced in the engine cylinders, said means being adapted to regulate said shutter device so as to regulate the flow of air through the radiator.

6. The combination of an internal combustion engine, a cooling system therefor including a radiator, means for controlling the flow of air through said radiator, said means comprising a shutter device associated with the radiator, and a motor for actuating said shutter device operated by the power derived from the engine, said shutter device being adapted to close as soon as the engine stops.

7. The combination of an internal combustion engine, a cooling system therefor including a radiator, means for controlling the flow of air through said radiator, said means comprising a shutter device associated with the radiator, a motor for actuating said shutter device operated by the power derived from the engine, said shutter device being adapted to close as soon as the engine stops, and a thermostatic device for governing the operation of said motor.

8. In combination with an internal combustion engine having a water cooling system including a radiator, an electro-magnetic element energized and deenergized by the temperature of the cooling water acting on a thermostat, circuits therefor including a source of electric energy, a cylinder and piston including a movable head for the cylinder formed to act as a valve, said electro-magnetic element being adapted to move the head, means to connect the head with the intake manifold of the engine, a shutter for the radiator, and means to connect the shutter to the piston to actuate the shutter.

9. The combination of an internal combustion engine, a cooling system therefor including a radiator, means for controlling the cooling capacity of the radiator, and means directly responsive to suction produced in the engine cylinders, for actuating the controlling means.

10. The combination in an internal combustion engine, a cooling system therefor including a radiator, means for controlling the

cooling capacity of the radiator, means directly responsive to suction produced in the engine cylinders, for actuating the controlling means, and a thermostatic device governing the operation of the means responsive to suction.

11. The combination of an internal combustion engine, a cooling system therefor including a radiator, means for varying the cooling capacity of said radiator, a motor adapted to actuate said means, said motor being connected with the intake of the engine, and adapted to be actuated by the suction of the engine in said intake.

12. In a combination with an internal combustion engine having a water circulation system including a radiator, a plurality of means one of which is operable by the temperature of the cooling water, and another operable by the suction of the engine, said means being adapted to regulate the flow of air through the radiator.

In testimony whereof I affix my signature.

CHESTER M. DOWELL.